

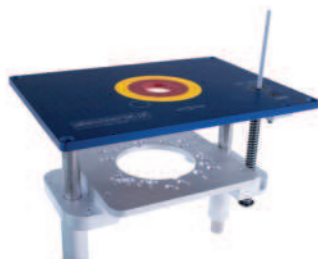
WOODWORKING CRAFTS

Hand, Power & Green Woodworking • Turning • Restoration • DIY



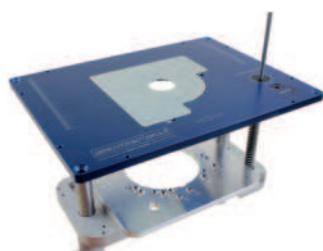
Queen Anne-style carving **Knock-down shelves** Shaker furniture **Build a front porch** Bandsaw guide **Garden jigsaw puzzles** Saw sharpening **Wall cabinet**

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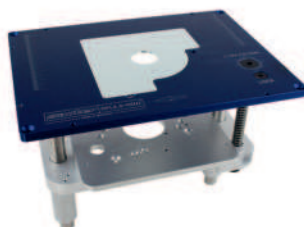
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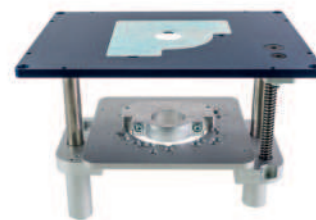
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WOODWORKING CRAFTS

Issue 69



WELCOME

With the easing of Covid-19 restrictions, hopefully you are all getting out and about and are able to replenish your wood stocks, which you've told us were depleted through lockdowns. With that in mind, we've a few pieces of furniture for you, with a great wall cabinet, and part one of our artisanal hall table project.

Charles Mak shows us a technique for making knock-down furniture with a set of ladder shelves. We look at Shaker-style furniture and Rick Rich is inspired to make a three-legged candlestand table. In the next issue, he'll be making the matching chair, pictured with it.

Ready for fun and games? Make colourful garden jigsaw puzzles, a classic backgammon board and turn yourself a table skittles game.

Enjoying the summer weather, James Hatter tackles an epic DIY

job, building a new front porch on his house. Michael Barrington shares his latest project, a beautiful orchard bench and John Bullar builds a garden table from decking boards. We also discover the many benefits of a walk in the woods.

Of course, we've still got a great selection of technical articles, including Steve Bisco carving onto a pre-purchased Queen Anne-style table leg, Mitch Peacock's guide to sharpening saws and how to get the most from your planes, bandsaw and boring brace.

As always, we love to hear from you and see your latest work, so please contact us at WWCEditorial@thegmcgroup.com or on Instagram@woodworkingcrafts

Happy woodworking!

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Woodworking is an inherently dangerous pursuit. Readers should not attempt the procedures described herein without seeking training and information on the safe use of tools and machines, and all readers should observe current safety legislation.

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WOODWORKING CRAFTS

If you would like to be featured in *Woodworking Crafts* please email wwceditorial@thegmcgroup.com



Knock-down ladder shelves

Charles Mak demonstrates an easy way to make knock-down furniture

Ready-to-assemble furniture offers ease of assembly and transportability. Cross dowels, corner joiners and tension rod nuts are a few examples of the knock-down fasteners used by furniture and cabinetmakers for this type of furniture. A recent entry to the knock-down hardware field has been the Domino connectors for use with the Domino Joiner.

Compared to traditional knock-down fasteners, the Domino connectors, however, are expensive, and they only work on materials that are at least 18mm thick. Tasked to build some detachable ladder units with shelves that are only 16mm thick, I found my Domino connectors kit of little help. Eventually, I succeeded in working out a Domino joinery solution that combined the use of both the dominoes and the traditional knock-down fasteners.

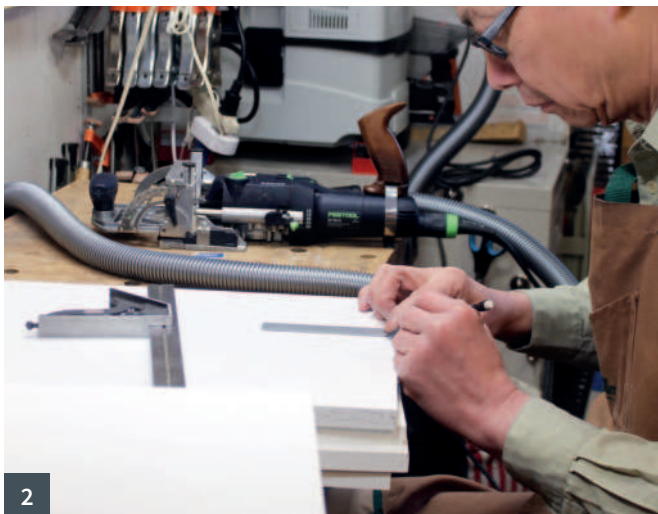
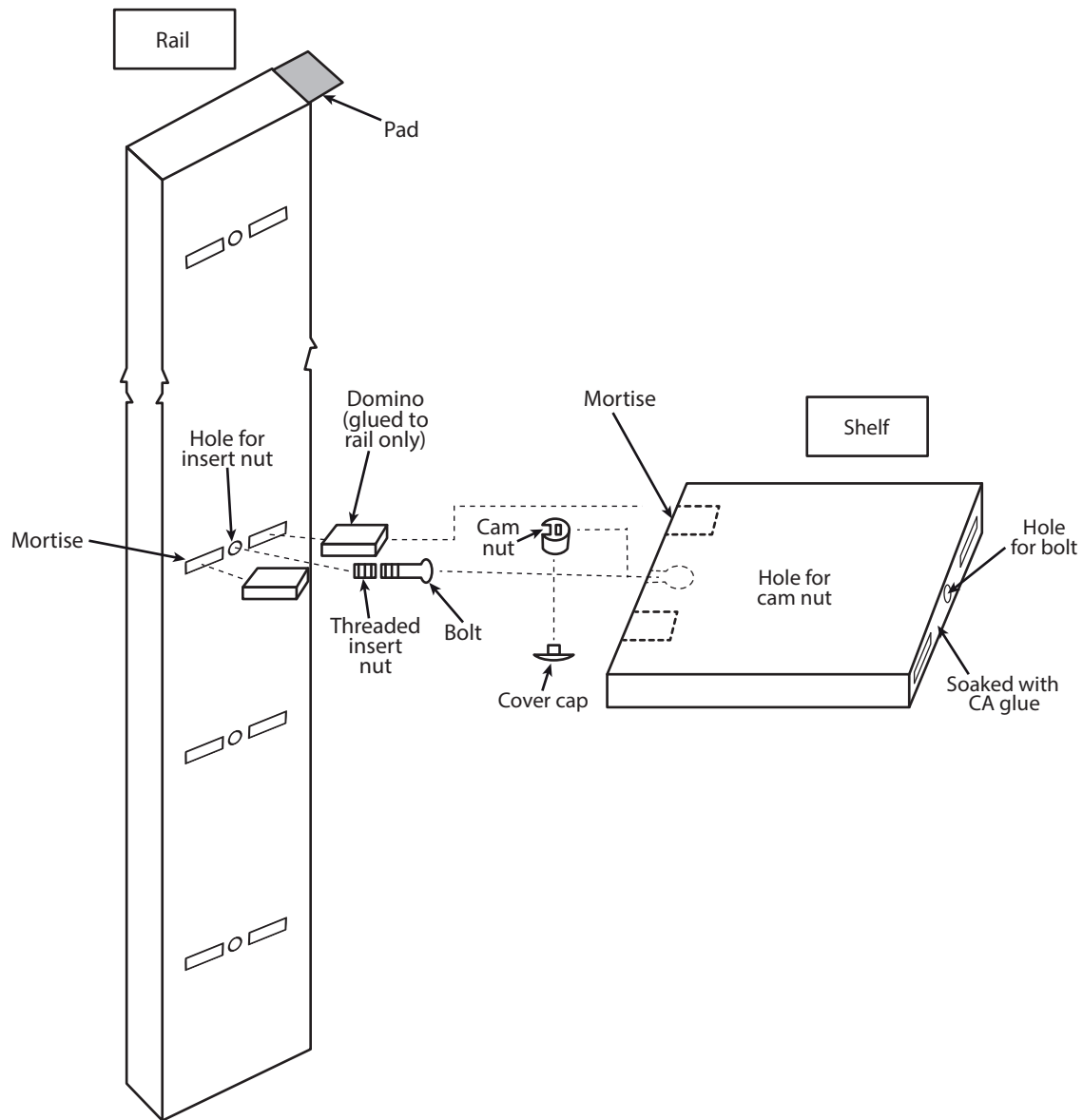
The knock-down joinery

In a previous article on a leaning display shelf (see *Furniture & Cabinetmaking* issue 282), I showed how to make slanted mortises with an angled jig. The ladder units I cover here and that leaning shelf share the same design, except that the knock-down units are taller, wider and deeper. I used the same angled jig for this knock-down project, but I changed the placement lines on the jig so that the mortises would be cut and spaced further apart to support the deeper shelves (**photo 1**).

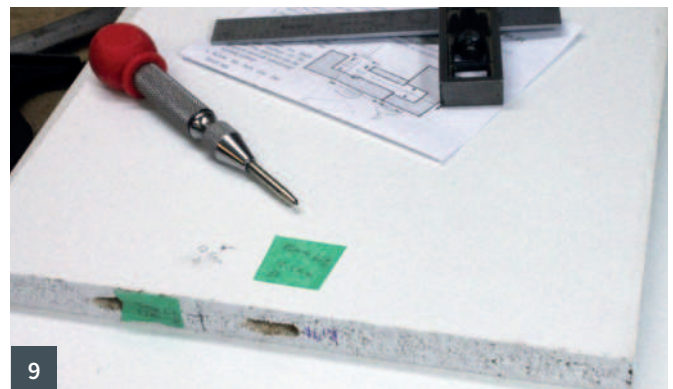
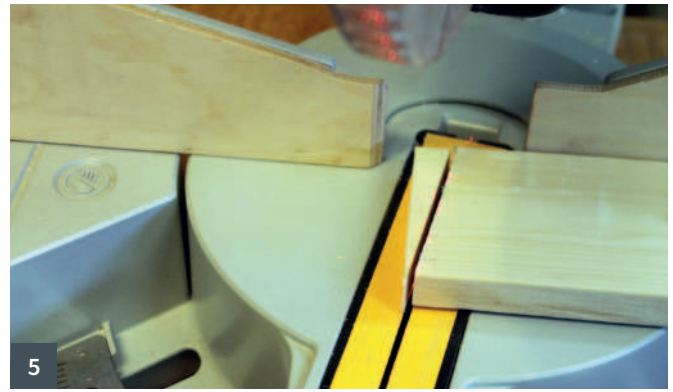
For the knock-down version, dominoes are glued only on the rails so that the shelves can be removed from the ladder unit itself. To hold the rails and shelves together in assembly, ordinary and economical knock-down fittings are used (see the diagram opposite).



1 The placement lines were changed on the jig to make sure the mortises were spaced further apart



PHOTOGRAPHS BY CHARLES MAK



4 The jig was clamped to the rails before mortising them **5** The ends of the rails were crosscut at the leaning angle **6 & 7** Using squares for guidance, the cut lines were marked on the top boards **8** The pencil lines were removed **9** The centre points for the insert nuts and cam nuts were marked on the rails and shelves

Mortising the shelves and rails

In the first step, I marked the placement lines for the mortises on the shelves (**photo 2**). To make the plunging easier, and reduce fatigue, I mounted a handle on the Domino Joiner before mortising the shelves (**photo 3**).

To mortise the rails, I clamped the jig to the rail (**photo 4**). After cutting all the mortises, I crosscut the rails' ends at the leaning angle (**photo 5**).

Trimming the top two shelves to depth

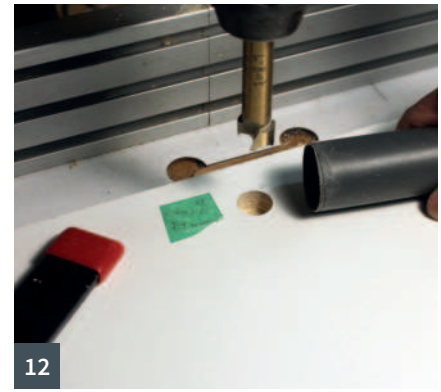
I dry-assembled the ladder shelves to determine the final depth of the two upper shelves so they would not get in the way when the ladder was leaned against the wall. Using a framing square and a smaller square, I marked the cut lines on the two top boards (**photos 6 & 7**). Lastly, I trimmed them to depth, and removed the pencil lines on all the shelves with alcohol (**photo 8**).

Installing the knock-down fittings

Each set of fittings includes a threaded insert nut, bolt, cam nut and cover cap. Based on the product instructions, I laid out the centre points for the insert nuts and cam nuts on the rails and shelves respectively (**photo 9**). Then holes for the fittings were bored as follows:

1. Drill the insert nut holes on the rails with a stop collar (**photo 10**).
2. Drill the endgrain holes on the shelves for the bolts, using a self-centring drilling guide for precision (**photo 11**).
3. Bore the cam nut holes on the underside of the shelves with the drill press (**photo 12**).

Before dry assembly, I soaked the endgrain in the joint area with CA glue to reinforce the wood fibres (**photo 13**). Finally, to seat the cam nuts flush with the surface, I found it necessary to grind a little off the bottom of the nuts (**photo 14**).



10 The insert nut holes were drilled on the rails ... **11** ... then the endgrain holes were drilled on the shelves ... **12** ... and the cam nut holes were bored on the underside of the shelves **13** The endgrain in the joint was soaked in CA glue before the dry assembly **14** Some adjustment was needed to get the cam nuts flush with the surface **15** The bolts were screwed into the insert nuts **16** To complete the assembly, the cam nuts were turned to secure the joints **17** This system is effective and won't hurt your budget!

Completing the quick-connect joints

In the final assembly, I tapped the insert nuts flush on the rails and screwed the bolts into the insert nuts (**photo 15**). I glued the dominoes on the rails, and installed the shelves. Lastly, I secured the joints by turning the cam nuts, and placed the cover caps (**photo 16**).

My combination approach offers a practical alternative for furniture makers to build knock-down projects – without breaking the bank (**photo 17**).

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CARVED QUEEN ANNE LEG

Steve Bisco carves authentic period detail on a plain Queen Anne leg

My late father, who was a carpenter and joiner in his younger days, used to joke that Queen Anne must have been a strange looking woman judging by the shape of her legs. The poor queen, who reigned 1702–14, did indeed suffer with many medical problems, but we can take comfort that the Queen Anne legs we see on furniture dating from her reign were not based on the queen's own legs. It is said that the shape, consisting of an upper convex curve and a lower concave curve, was based on the legs of certain four-footed animals, and dates back to ancient Greece and China.

The Queen Anne leg, also known as a cabriole leg, became popular in Britain and France in the early 1700s, and has never really left us since. It is still used to give a period look to cabinets, tables, chairs, settees and footstools, as any furniture catalogue will show you. Its construction is more complex than a conventional straight leg, but anyone wanting to add a bit of period charm to a piece of furniture can easily buy plain beechwood cabriole legs online for a few pounds.

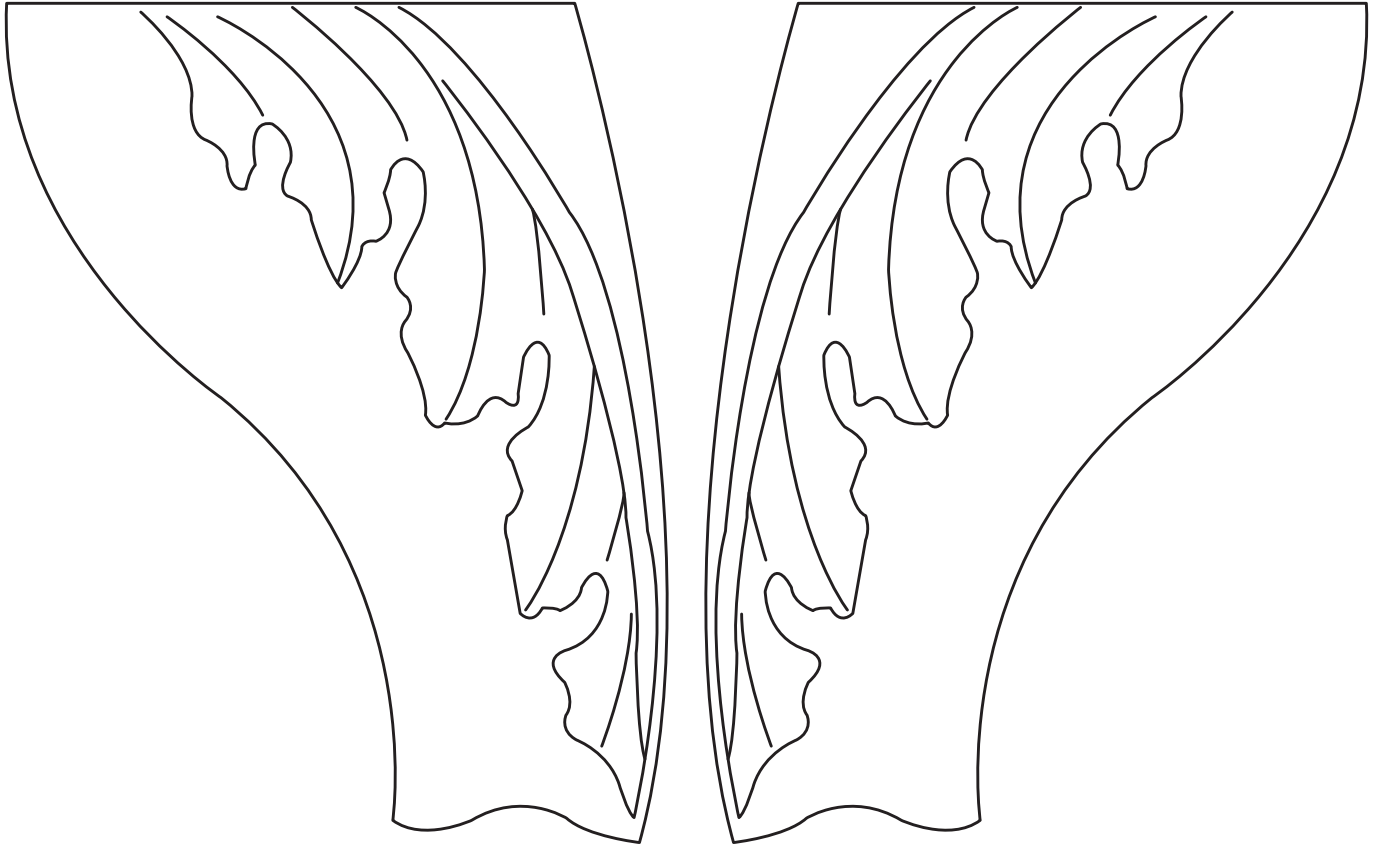
The more enterprising woodworker can, however, add a bit more class to the plain bought-in leg by carving on some classical decoration to give it a true period look. This usually comprises two features – a 'ball & claw' foot, and some acanthus leaves over the upper 'knee'. When buying cabriole legs for this project, make sure the foot has enough bulk in it to accommodate a ball & claw carving. Some legs have quite flat and slim feet that will not be sufficient. In this article I will be using a plain 280mm beech wood leg which I bought online for £10.

Carving with beech wood

Beech is typically used for furniture legs as it is strong and works to a fine finish. It also glues well, which is important to the construction of a cabriole leg. Beech is not typically used for carving as it is quite hard, but it has a close grain and on shallow features and with the aid of a mallet it can be carved to a good finish with fine detail.

Although some of the carving and smoothing can be done by pushing the carving tools along the surface, much of the work needs to be done by tapping the tools with a mallet. A small mallet is best as you don't need big whacks to cut out the small amount of wood removed for the low-relief details in this carving. Tap the tool just hard enough to drive it a few millimetres at a time in a controlled manner.





YOU WILL NEED

Gouges:

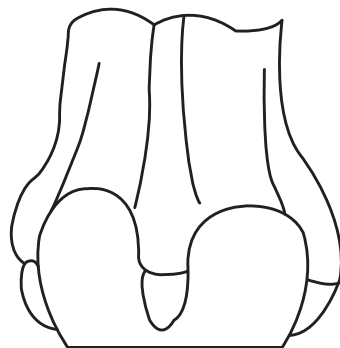
- No.2, 25mm
- No.3, 10mm
- No.5, 7mm
- No.8, 8mm
- No.9, 3mm
- V-tool – 6mm straight, 2mm straight

Chisels:

- Flat – 20mm, 6.5mm, 3mm, 2mm

Materials:

- Ready-made beech wood chair leg (280mm) in Queen Anne style
- Carbon paper
- Wax pencil
- Abrasives
- Polish





1



2



3



4



5



6

Preparations

- 1 Buy in two or four Queen Anne style legs of a size to suit the piece of furniture you are going to use them on. You can get these quite cheaply online and in some home improvement stores. This example is a 280mm beechwood leg, but as we will just be carving the foot and the 'knee' the length of the leg has little bearing on the carving.
- 2 To hold the leg still in a workable position, attach it to your bench using some small steel angle brackets screwed into each end of the leg. Add further support with small blocks of wood at the upper end, and under the leg to resist jarring from the mallet.
- 3 The first job is to draw the ball & claw pattern on the foot, and the acanthus pattern on the knee. You can trace on the acanthus pattern with carbon paper by printing out the drawing to fit your cabriole knee. Because of the convex curve it has to be traced on in two halves either side of the centre line. The drawing may need some adjustment to fit your particular leg. The circular nature of the foot makes tracing

the ball & claw pattern impractical, so you need to draw it on carefully using a wax pencil (graphite makes the wood grubby).

Carving the ball & claw foot

- 4 Start on the foot by cutting out the ball between the claws. Cut around the edges of the claws to a depth of around 4–5mm, and round over the ball inside the claws to form about two-thirds of a sphere. A No.3, 10mm gouge is best for cutting the edges and for rounding the ball to a smooth surface. Go carefully and watch the grain direction so you don't break bits out.
- 5 Hollow out the parts of the leg above the ball using deep gouges to make the 'bones' of the toes stand out from the leg. Blend the hollowed area into the leg at the thinnest part of the 'ankle' using shallow gouges.
- 6 Shape the talons and knuckle joints on the toes, and round over the 'bones' as they merge into the rest of the leg. These features are quite small and a bit fiddly, so carve them carefully.



- 7 Turn the foot around and remount it to repeat the process of carving the ball and claws at the back of the leg.
- 8 With the ball & claw foot carved, use abrasives to blend it into the leg and sand it smooth.

Carving the knee

- 9 To start the acanthus carving on the knee, use a V-tool (preferably 2mm) to carve around the edges of the acanthus leaves to a depth of about 2–3mm. Be aware that the slope of the grain direction will change at the most forward part of the knee so you will mainly need to work away from this high point.
- 10 Now use a shallow No.2 gouge, or a flat chisel, to carve away the adjacent surface of the leg down about 2–3mm to leave the pattern standing above the surface in low relief. Carefully reshape the

surface to blend the lowered level into the existing surface so the leg all looks smooth and regular.

- 11 Use the fine V-tool again to carve the double V lines in the middle of the knee. Round over the edges of the V with a No.5 gouge and work them to a smooth regular curve.
- 12 Now we tackle the shallow grooves and hollows on the acanthus leaves. Carve along each side of each leaf with a No.8, 8mm gouge to leave a ridge along the middle. Use a No.9, 3mm gouge in the narrower grooves where the leaf runs into the side of the V lines. The carving is very shallow and subtle in this low-relief decoration. Make sure you get a smooth flowing curve to each groove and ridge or you will lose the traditional acanthus-swirl effect. Finally, tidy up the edges of the acanthus leaves, with their distinctive 'eyes'.



13



15



14

13 Use abrasives to create a smooth and even surface to the reshaped leg, then give the low-relief carving a light sanding with 400-grit abrasive. The carving needs to look smooth, as befits a piece of furniture, but don't obliterate the detail with the abrasives.

14 Here is the Queen Anne leg carved and sanded, looking altogether more ornate than the blank bought-in leg we started off with.

15 The finish you put on your Queen Anne legs will depend on the piece of furniture you will be using them on, but I finished this one with Liberon Garnet French Polish, putting the first coat on by brush and then using a cloth to build up further coats.

16 Here is the finished leg, looking suitably antique.



16

GARDEN JIGSAW PUZZLES

Fred and Julie Byrne get creative with the scrollsaw to make three large, nature-themed puzzles

Here are three puzzles to make with the great outdoors in mind, just the thing to keep the little ones occupied during the summer! The puzzles are large and brightly coloured, so hopefully there'll be no hunting in the grass for any lost pieces. Depending on the size and paint you choose, they may not be suitable for very young children.

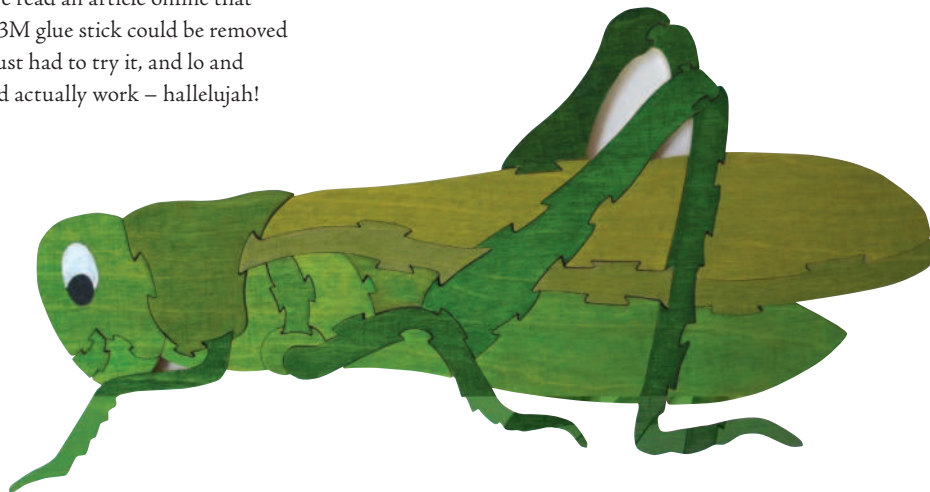
Cutting out large patterns

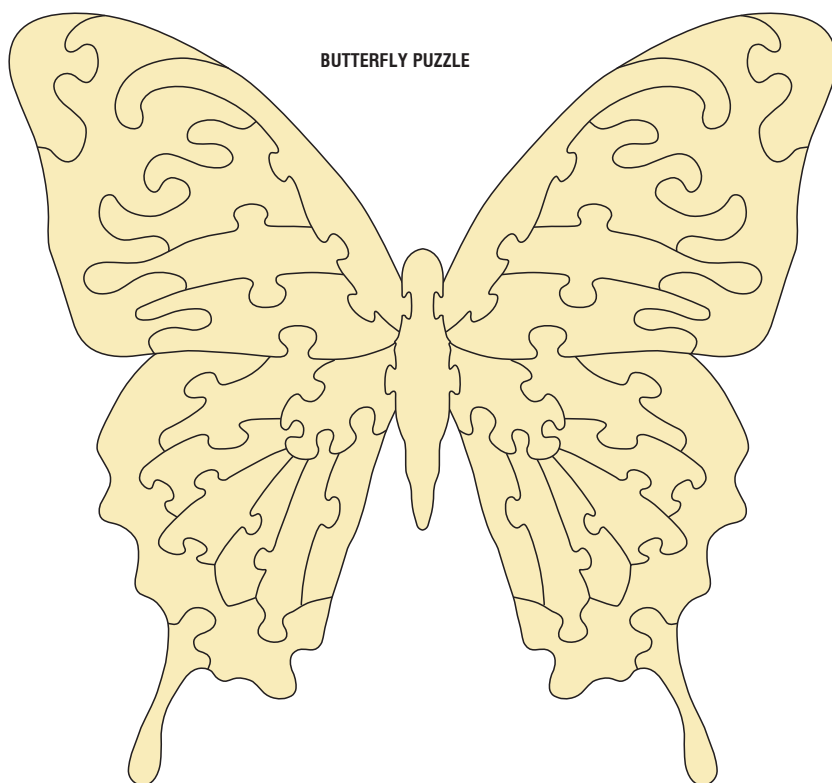
If you would like to make quite large puzzles, greater than the depth of the throat on your scrollsaw, the way to start is to follow the pattern cut lines into the centre as far as you can go, then carefully back the blade out before cutting into the centre again from another direction – this will enable you to create smaller, more manageable, pieces.

Alternatively, opt for a spiral blade – they do take a bit of getting used to but can, of course, cut in any direction.

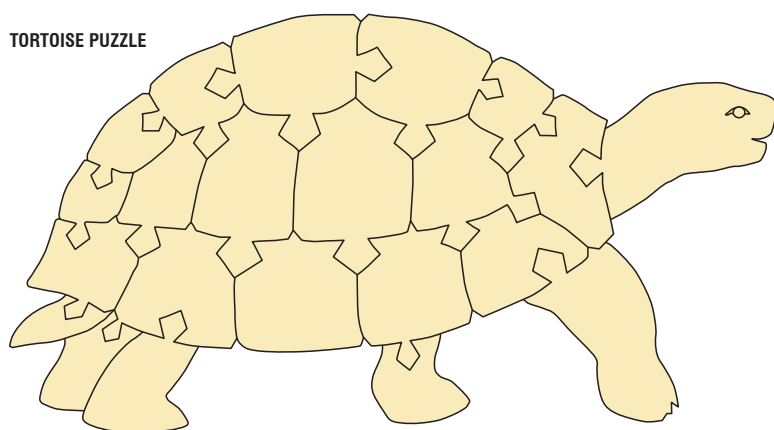
Adhering patterns to the wood surface

Attaching scrollsaw patterns to your wood selection can be somewhat troublesome – especially when later trying to remove them – so when we read an article online that said Scotch 3M glue stick could be removed cleanly, we just had to try it, and lo and behold, it did actually work – hallelujah!

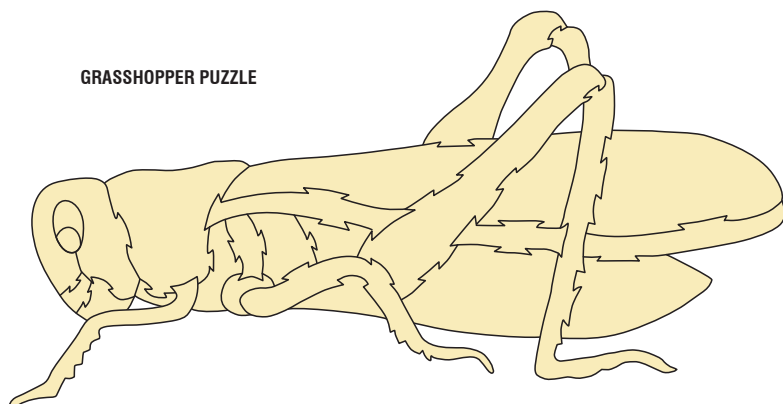




BUTTERFLY PUZZLE



TORTOISE PUZZLE



GRASSHOPPER PUZZLE

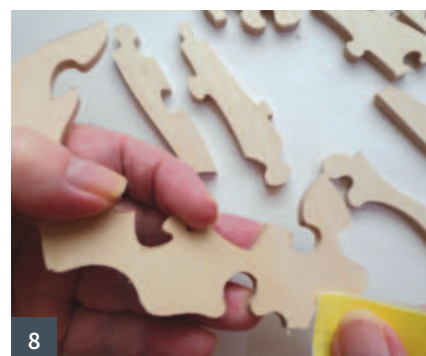
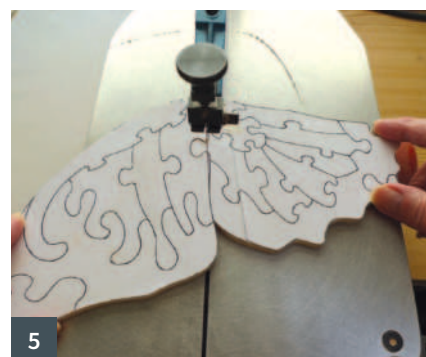
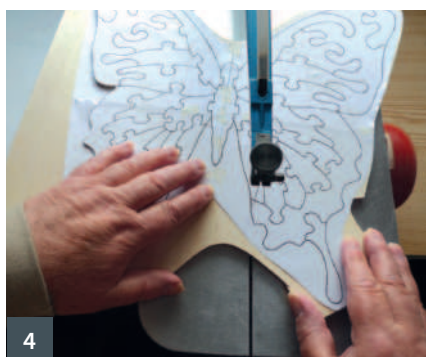
YOU WILL NEED

- 6mm birch plywood
- Scrollsaw with No.2 skip tooth
- Blade
- 3M glue stick
- Sandpaper & block
- Selection of acrylic paints
- Varnish
- Artist's brushes
- Masking tape
- Sanding block
- Masking tape
- Glue stick
- Wood glue
- Acrylic paints – yellow, black, light grey & silver
- Acrylic slow dry medium – optional
- Black marker pen
- Acrylic matt varnish
- Clear wax polish
- Soft cloth & buffing brush



Getting started

- 1 Prepare a quantity of 6mm plywood by sanding both surfaces smooth using a sanding block, going through the grades of paper.
- 2 Enlarge the pattern/s to the desired size and using the 3M glue stick, adhere them to the prepared plywood.



Cutting out

- 3 Next, roughly cut around each individual pattern to make more manageable pieces.
- 4 Fit the scrollsaw with a small No. 2 blade – this will keep the gap between each puzzle piece to a minimum. Start by cutting all around the perimeter of the piece ...
- 5 ... then follow the cutting lines through to the centre.
- 6 After making the actual workpiece more of a manageable size, continue on until all the pieces have been cut out.
- 7 Remove the paper pattern from the plywood, a procedure which, it has to be said, has been made a lot easier after using the 3M glue stick.
- 8 Next, use 280-grit sandpaper to remove the burr from the underside of each puzzle piece – this will allow the pieces to lay flat.

Colouring

- 9 Make up the puzzle and decide on which, and how many, colours you are going to use, then place the pieces into groups so there are no mistakes. We used acrylic colours mixed with a slow dry medium, but the choice is yours.
- 10 When dry, give the grasshopper and tortoise an eye each – using a small artist's brush paint the white of the eye on first and then the black. Lastly, apply a coat or two of varnish.





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With the current rise in interest in unplugged woodworking, and the plethora of vintage and other old used saws for sale on auction sites, Mitch Peacock shares his saw sharpening process

SHARPENING SAWS

Unless you experience using a sharp traditional saw, you could be forgiven for assigning them to history and choosing the modern alternatives with induction hardened teeth. These modern saws have universal cut teeth, good for both rip and cross cuts in common timbers, and retain their sharpness very well. Sounds good doesn't it, but their sawing performance lags behind a sharp traditional steel saw, with the tooth geometry chosen to match the cut in hand.

I can still remember my father sharpening his saws when I was a little boy. This was a regular occurrence, and a chance for me to see the many different saws he kept, protected from rusting, in a large saw till. How he managed to achieve a good result with me under his feet I'll never know, as I certainly prefer to sharpen alone and with no distractions. Only when I took up woodworking seriously, many years later, did I understand why he had so many saws and used to file and use something like pliers on the teeth.

My childhood experience hard-wired me to sharpen my own saws. I picked up further information from numerous books and online resources, and experimented with old saws. Initially the results were patchy, but they soon improved. If you can handle a file, and make it follow some simple angles, then I suggest you try it yourself. A few tools, and a couple of jigs, are all you need to get started.



A few tools are all you'll need to get started



Four steps to sharp

I use just four steps to maintain sharp teeth, often known as topping, shaping, setting and pointing. Unhelpfully, slightly differing definitions for these exist, so I'll give mine here to avoid confusion.

TOPPING

The tips of all a saw's teeth should flow in a smooth line, usually a straight line. This ensures that they all take an equal part in performing the cut, making for a smoother and more efficient action. Broken teeth, uneven wear and poor tooth shaping can all affect the flow of the tips. Topping is the correction of this flow by filing along the toothline until it is a smooth line. The occasional single broken tooth is usually ignored, and not noticeable in use.

A second cut mill file is suitable for light to medium topping, whereas a bastard mill file is preferred where a lot of material needs to be removed. Both can be jugged at right angles to the saw plate by installing it in the side of a wooden block. A small recess should be made to avoid contact between the block and the set teeth (**photo 1**).

A light topping, just to reveal a tiny flat at the tip of all teeth, can help prevent major topping and shaping over the long term: half of this flat is removed from the front and rear of each tooth during pointing, maintaining both the toothline and individual teeth shape.

Applying permanent marker to the toothline makes topping progress much easier to see (**photo 2**).

SHAPING

Tooth geometry is a complex subject, determining the optimum shape for cutting woods of different hardness, with or across the grain, and pitching speed of cut against durability of teeth and surface finish. Shaping is the process of transferring the chosen geometry to the saw's toothline.

There are three angles used to describe tooth geometry, and applied to the way the saw file is held when shaping (and when pointing), as shown in Figure 1. All three are considered separately, but they do affect each other when compounded.

Rake: Angle that the front of the tooth makes with an imaginary line, perpendicular to the toothline, in the plane of the saw plate.

Fleam (or bevel): Angle that the front of the tooth makes with an imaginary line, perpendicular to both the toothline, and the plane of the saw plate, in a plane perpendicular to the saw plate height. When filing teeth with any fleam, the tip of the file should always point towards the toe of the saw; this is one reason why adjacent gullets are tackled from opposite sides of the saw plate.

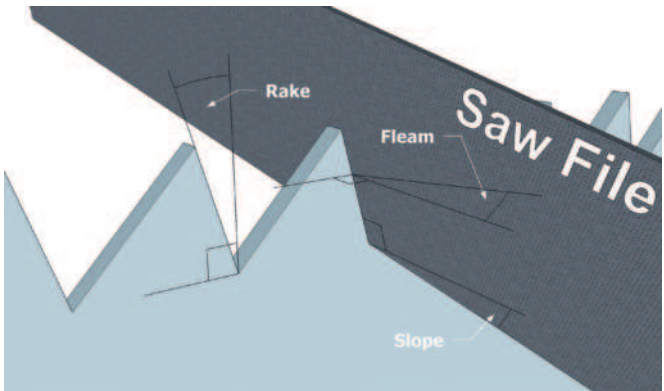


Figure 1

Slope: Angle that gullets make with an imaginary line, perpendicular to the toothline, and the plane of the saw plate, in a plane perpendicular to the saw plate length. As with fleam, saws filed with slope must have adjacent gullets filed from opposite sides of the saw plate.

To keep things simple, I shall focus on shaping both rip and cross cut teeth for general woodworking.

Table 1 below shows recommended ranges, and also the trade-offs, of these profile angles, and is included as a guide to help you experiment.

	RAKE	FLEAM	SLOPE
Rip cut			
Softest woods	0°	5°	10°
Hardest woods	10°	0°	0°
Cross cut			
Softest woods	13°	25°	30°
Hardest woods	15°	15°	20°
	Trade-off between speed and sawyer's effort	Trade-off between finish and edge retention	Trade-off between speed and tip durability

Table 1 – Recommended tooth profile angle ranges

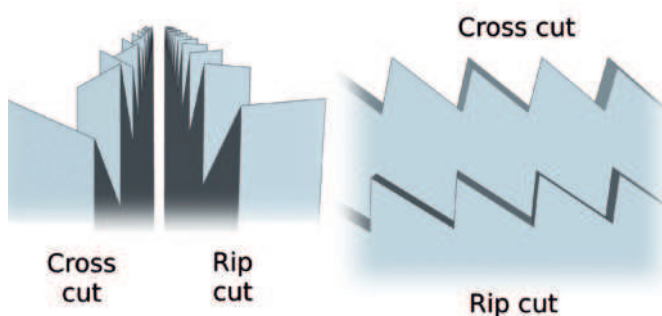


Figure 2

RIP CUT AND CROSS CUT PROFILES

Figure 2 shows the difference between rip cut and cross cut profiles. Rip cut teeth are chisel tipped. The cutting edge extends in a straight line across the tip of the tooth. For general ripping work I suggest a rake of 5°, fleam of 2° and slope of 5°.

Cross cut teeth are knife pointed. The cutting edge extends in a straight line from gullet to tip of the tooth. For general cross cut work I suggest a rake of 14°, fleam of 20° and slope of 25°.

For ease of alignment as you start your saw sharpening journey, try a rip saw with 0° for all three angles. This should result in a fast albeit rough cut, encouraging you to continue and try more complex profiles.

Shaping is accomplished with a triangular saw file. Each corner of the file cuts a 60° 'V', which forms both the front and rear of two adjoining teeth at the same time. By adjusting the sideways pressure applied when filing, more material can be removed from one tooth or the other, allowing an equal spacing of teeth (and equal gullet depth) to be maintained or restored.

SAW FILES

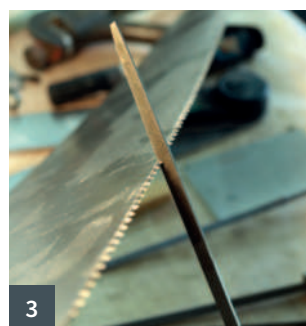
Saw files come either single or double ended, and in a range of sizes. With either, I prefer to add a handle to both ends during use. You should use a saw file designated to the tpi of your saw for pointing, but a size larger, that has a coarser cut, will shape teeth more quickly. The saw teeth will only cover between a third and one half of the width of the file, allowing the file to be rotated to a fresh corner once it dulls (**photo 3**).

Buy good quality saw file(s), and keep them just for this task. They will most likely last at least a half-dozen sharpenings, while still giving great results.

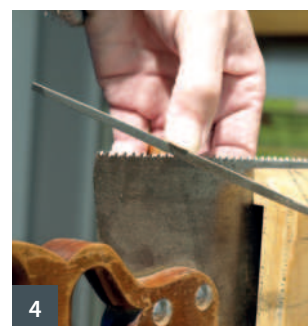
To copy the existing profile of a saw, where its geometry isn't recorded, can be difficult, so make a note of how you profile each saw. For larger saws, the filing angle can be approximated by seating the smooth central section of a double ended saw file (or the tip of a single ended one) into the least worn, full gullet (usually found at the toe or heel of the saw, **photo 4**). When seated tight against the flats of the fore and aft teeth, and into the base of the gullet, the file will assume the correct orientation to file rake, fleam and slope angles. For smaller saws, with fine teeth, this method is very hit and miss, so use recorded geometry. I use set-up guides marked out on my saw vise to align the file (**photo 5**).

Once the file orientation is set, a telltale stick can be attached to the toe of the file, which when kept horizontal and parallel to the saw plate will maintain rake and fleam (**photo 6**). With those kept in check, slope is easy to control by body position.

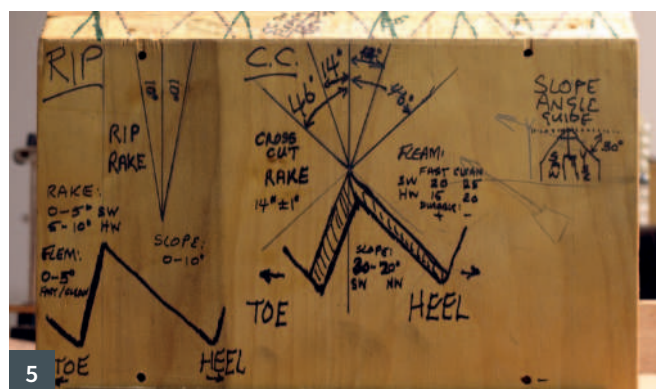
Unless you wish to change the function of your saw, shaping the teeth will just involve filing every other gullet from one side of the saw



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plate, until half of the flats on adjoining teeth (produced by topping) are removed, and then repeating on the other side of the saw plate for the remaining gullets, such that all the flats just disappear. Perform a close inspection before you start, so that you always file the gullets in the same direction across the plate as per previous sharpenings (except in the case of a rip profile with zero fleam and zero slope, where it will be impossible to tell).

To keep track of progress, try dabbing a permanent brush marker into the gullets before you start. As you file each gullet, the marker will be removed. With smaller teeth, I often use a weighted thread, moved into each gullet after it is filed (**photo 7**). Remember these tips when you get to pointing the teeth later on.

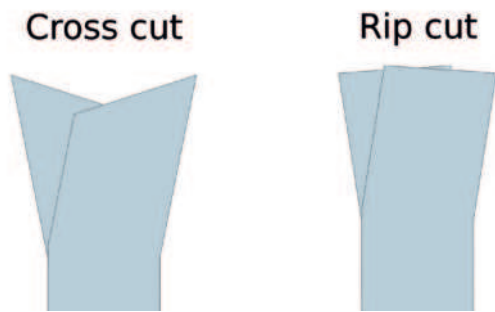


Figure 3

Setting

Setting a saw offsets the tips of alternate teeth to either side of the saw plate, creating a cut, or kerf, which is wider than the thickness of the plate (see Figure 3). This prevents the saw from binding in the cut, and is essential for all but the shallowest of saw cuts. However, the kerf also acts to jig the blade, helping maintain a straight cut, and so the amount of set should be restricted to that allowing the saw to function as required.

Setting will be required whenever a significant topping or shaping has been performed, or after a few successive pointings have been made without resetting. It is often easier to point a saw and try a test cut to determine if setting is required or not.

Setting is most easily done using a saw set (**photo 8**). These are adjustable to achieve a satisfactory amount of set. Half the teeth are set from one side of the plate, and half from the other, ensuring that the extreme tips are bent away from the plate, and not over it. Avoid reversing the set on teeth, which can develop stress fractures.

Pointing

I define pointing as the finish filing of the saw teeth (**photo 9**). Shaping is a relatively rough process, akin to grinding a bevel on a chisel or knife. In the pointing process the same geometry is used, but a lighter touch refines the cutting edges. I prefer to use a single-ended saw file for this task, taking a single, long, light stroke within each gullet. Use the permanent marker trick (described in shaping) to avoid double pointing any teeth, which would affect the smoothness of the toothline. Pointing alone, or after the lightest of topping, can be used a few times before considering setting or shaping again, making most sharpening a fairly quick task.

Testing

Don't just put your sharpened saw away – test it (**photo 10**).

So long as the steps were followed, the saw will cut, but ask yourself a few questions:

- Is it cutting fast?
- Is it cutting clean?
- Is it binding in the kerf?
- Does the cut drift to one side?

Changes to the tooth geometry can alter the first two, while increasing set will cure binding.

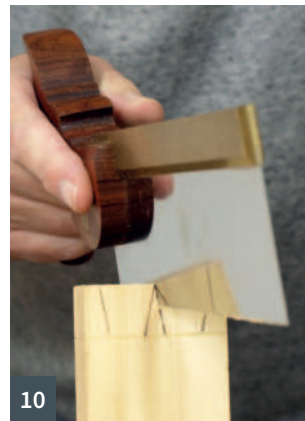
Drift suggests a non-symmetrical shaping, or setting, and can be addressed quickly by a light dressing of the toothline on the side which drifts with a medium diamond plate (**photo 11**).



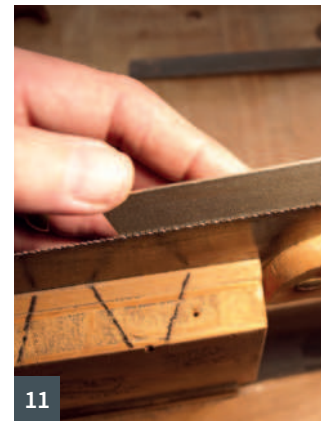
8



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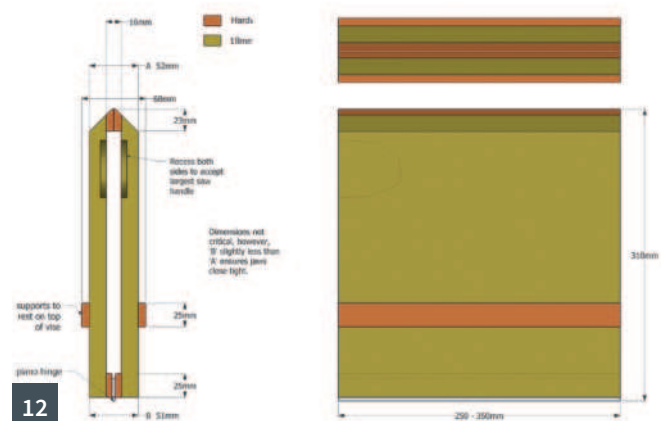
Dovetail saws

There is much debate over whether dedicated dovetail saws should be either rip or cross cut profiled. In my opinion, very decent results can be achieved, sawing both sloped cuts and shoulder cuts, with a saw prepared closer to a rip cut, with rake of 10°, fleam of 5° and slope of 10°.

Shop-made saw vice

Filing teeth is much easier when the saw plate can be held close to the toothline to reduce vibrations. Any number of solutions may be found to achieve this, but I include a design for a simple saw vice that is held and operated within a front bench vice (**image 12**). I recommend running a sheet of plastic below the saw vice and across the work bench, to collect the filings.

If I've whetted your appetite to try saw sharpening, remember to practise on a few cheap saws first.



12



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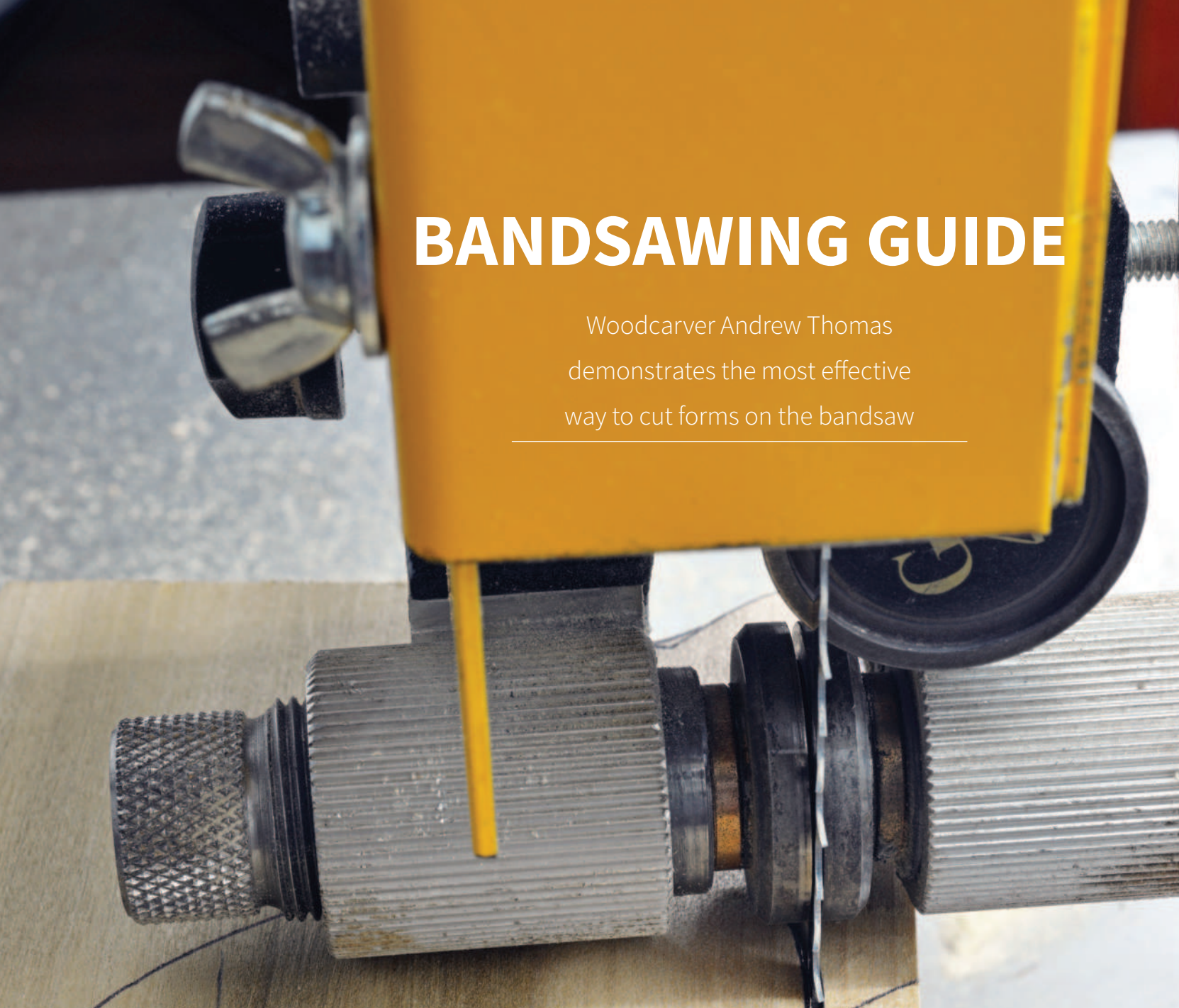
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BANDSAWING GUIDE

Woodcarver Andrew Thomas
demonstrates the most effective
way to cut forms on the bandsaw

The bandsaw is arguably the most important machine a woodworker will ever invest in. It saves them much time and effort by allowing the speedy removal of all the waste wood around the profiles of the form they want to carve. It is therefore vital to learn the basics of how to use the machine safely, effectively and accurately, so the actual carving of the subject can begin as quickly as possible.

The skill of bandsawing requires many years of experience to perfect by experimenting with a multitude of different forms, each creating various complications to consider and overcome. Learning to set up the bandsaw correctly and safely is a fundamental necessity. But then one must look closely at each design that is to be cut, and initially work through the process intellectually to consider and understand in what direction the cuts should be made and in what order before the cutting procedure begins.

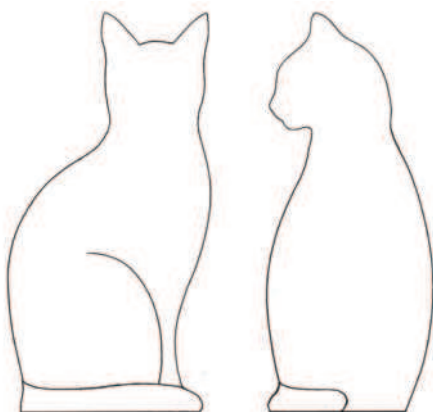
For the purpose of this article, I will show how to cut a cat form which I used for a previous carving project. It shows all

of the fundamental cuts I use when bandsawing any profile ready for carving.

Bandsaw safety

Safety when using machinery is of vital importance, so please ensure that you carefully study and follow your machine manufacturer's guidelines to set-up and use. Always wear a dust mask, wear eye protection, attach a dust extractor to the machine, use a sharp blade, and never – but never – try to 'force' a cut. And always keep your fingers out of the line of cut and away from the blade. Use push sticks whenever appropriate to do so.

Never, ever, attempt to bandsaw a form that does not have a flat, square edge in contact with the bandsaw table. If this is attempted, the blade will force it out of your hands in a blink, and no doubt thrust it back up towards your head. The consequences could also cause awful injury to your hands if they were to touch the blade.



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1 This is the two-part form I will be cutting on the bandsaw **2** Plane the block flat and square **3** Draw a straight line on the front and side edges of the block **4** Transfer the front and side-view profiles on to the block **5** Allow a 30mm section under the design to attach to the vice **6** Adjust the blade guides as close as possible to the blade

Timber, templates and holding

The first job is to select an appropriate piece of timber that has the correct dimensions for the scale of your project, but also allows 6–8mm outside of the design lines. The timber then has to be planed perfectly flat and square on all sides, so that when the front and side profiles of the design are cut, they are in precise alignment with each other.

Scan or photocopy the drawings you are using – in this case it is a cat – enlarging or reducing them to the correct size for your wood or size of project you wish to make, and print them out on to card to be used as templates. Measure the length of the design and mark this on your wood. Then use a try-square to draw a straight line from this position across the front and side edges where the designs will be placed.

Use the templates to transfer the side view centrally on to the widest side of your block, and the front view centrally on to the narrower edge. Make sure that they are both the correct way around, otherwise the form will be back to front, and also ensure

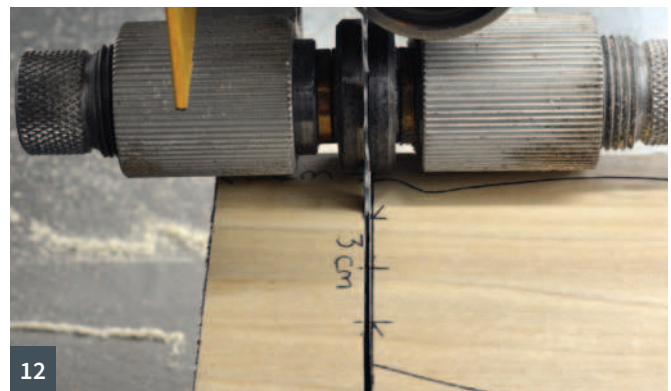
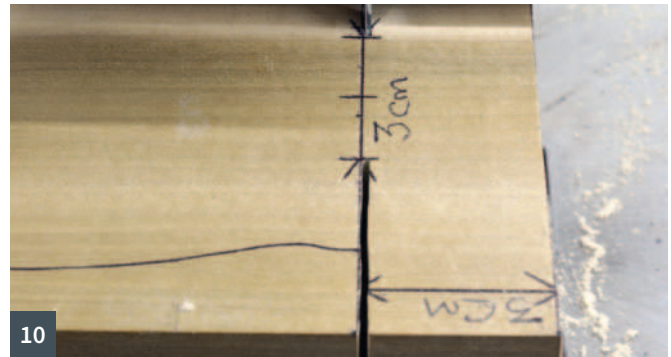
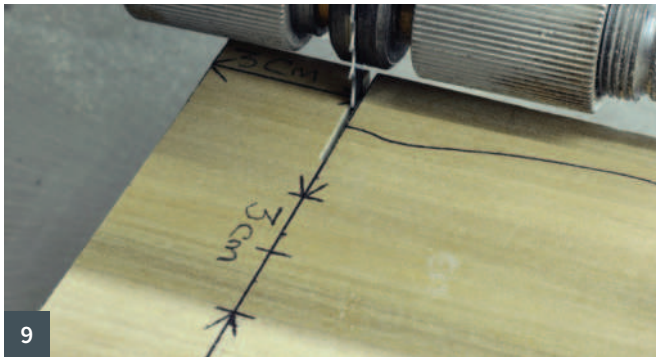
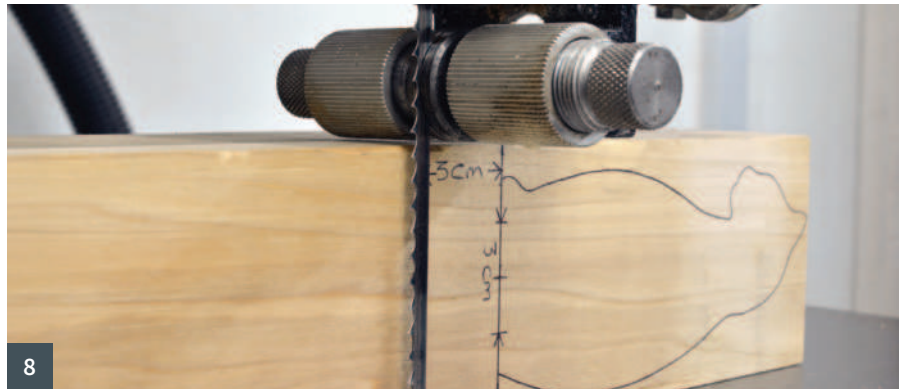
that the grain direction is running vertically through the block.

Some thought must be given as to how the block is going to attach to your carving vice. In this example, a 30mm block will be left directly underneath the cat's form, which will attach directly to the faceplate. Measure and mark this in position.

Depending on the subject matter, it can be very useful to make a horizontal cut on all sides, underneath the lower edge of the design, which facilitates this lower edge being more easily carved. Simply mark the central position of each profile view, then measure out 15mm either side and mark this on the wood. When this is cut, the cat form will essentially be attached to the base by a 30mm square block underneath, which is more than strong enough.

Setting up a bandsaw

Before we start the cutting, a brief word on setting up the bandsaw correctly. First, the blade should be correctly tensioned according to



7 A 6mm skip-toothed 4tpi blade **8** The blade guide set 1mm above the timber **9** Cut directly along the lower edge of the line **10** Cut up to the 30mm mark **11** Adjust the blade guides for the front view **12** Repeat the previous steps

its size and the machine manufacturer's guidelines. Then the two blade guide bearings, one either side of the blade, need to be adjusted to within a fraction of a millimetre from the blade. The rule of thumb dictates the width of a piece of paper.

The recommended blade for nearly all carving projects is a 6mm, skip-toothed 4tpi (teeth per inch), high carbon steel one. This blade can cut a very tight curve of about 16mm diameter into very thick timber. This should be positioned with the teeth just proud of the blade guide bearing either side, and with the rear thrust bearing a fraction of a millimetre behind it.

The height of the blade guides should be set approximately 1mm above the height of the timber on the side view, which will be cut first. This will be adjusted again later when the front-view profile is cut.

First cuts

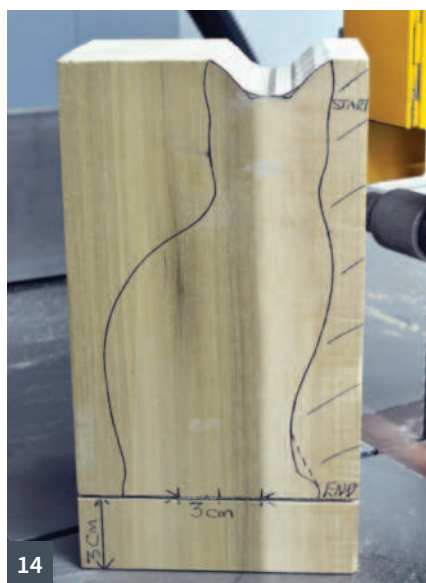
The first cut is directly along the outside of the lower line on the side

view, up to the 3cm mark. When making 'stopped' cuts such as this, the blade needs to be 'backed out' every 10mm or so. If this is not done, the fine dust builds up behind the blade, causing it to become stuck in its own channel. If this does happen, switch the machine off and then use a very thin metal shim or 150mm steel rule to clear it out.

Now do the same on the opposite side, remembering to back the blade out of the cut every 10mm, and stop at the 30mm mark.

The height of the blade guides will now need to be adjusted to the correct size of the front-view profile. Do this and then check that the blade guides are still in their correct positions in relation to the distance from the blade. Adjust if necessary.

Repeat the steps of the earlier cuts and along the front-view profile to produce the 30mm square, solid section at the very base underneath the form.



13 Cut the easiest section first **14** Remove this section with one continuous cut **15** Cut slowly and delicately **16** Now remove this section **17** Dust off the whole piece **18** Reform the block

Clogging

Denser timber, such as walnut and oak, produces a far coarser dust than lime or basswood when bandsawn, which creates less of a problem with the build-up of dust behind the blade. Therefore, the blade can be backed out every inch or even more. Do a test each time you start cutting out a project to see how the species of timber behaves.

Angled corners

When cutting into an angled corner, it is sometimes wise to not cut the actual angle unless you are absolutely sure that its position will not be adjusted when the subject is carved – which is more often than not the case. If you wish to leave yourself some leeway in these areas, cut in as close as you can with a curved cut, and simply carve the corner details later.

Cutting a curved body

The height of the blade guides will now need to be adjusted again to the

correct size of the side-view profile. This area between the cat's ears is definitely a position that should not be cut angled. Work directly along the outside of the line in a sweeping curve to remove this small section at the top of the head.

The first profile to be cut is always the simplest side of the design, which ideally should be made in just one continuous cut on each side. This is very important because the block has to be reformed squarely again for the second profile to be cut. The lower edge on the right-hand side here has a tight curve that is too sharp for the blade to follow. The dashed line shows the approximate angle of cut.

Cutting and manoeuvring the block accurately is not a simple task and takes a lot of practice to become accomplished at, especially around tight curves. It is a tricky combination of moving it both forwards into the blade and turning it around, slowly and delicately, at the same time.

Start at the top position of the ears on both sides and work down towards the base, slowly along the outside edge of each line.

The side-view profile has now been cut on both sides and needs to have



19 Cut the simplest side first **20** Now cut the opposite side **21** Dust off and mask together **22** Cut along lines E and then S (from nose) **23** Cut from lower S up to E **24** The completed two-profile form

all of the dust carefully brushed off the surface. The two offcuts also need to be dust-free so that the masking tape sticks effectively to them.

Reform the solid block

The block must now be reformed to its original shape so that the front-view profile can be cut safely and accurately. Use a good quality 50mm masking tape to cover the cut lines around the complete block. Ensure that the tape does not cover the front view drawing, nor the opposite edge that will be in contact with the table, otherwise this will mean your block, and consequently your cut, will not be level.

The height of the blade guides will now need to be adjusted to the correct size of the front-view profile. Cut the simple line on the right side first, then tape it back together in position again.

This final side is the most difficult area to tackle, due to the tight curve from the chin around the line of the neck to the side. This will be accomplished with four different cuts. First, cut from the top position of the ear, down along the dashed line side, and terminating at the base.

Remove this section of wood, brush off all of the dust and run some masking tape over this edge to hold the block tightly together again. Note the dashed line, and the start (S) and end (E) positions which signify the direction of cut.

Make the first cut along the dashed line, up to the line of the neck. Don't forget to back your blade in and out of the cut every 10mm or so.

Now, cut down from the tip of the nose around the mouth and chin area, terminating and joining the cut at the end of the dashed line. If you find the angle a little tricky to follow around and under the chin, then simply cut into the dashed line and go back to it once or twice again from a slightly easier angle. This line of cut up the side is much easier to accomplish. Start this as shallow as possible so as not to cause an uneven join on the side. Then simply work up to the dashed line cut and the waste wood will drop off, leaving this side completed.

You can now peel off all of the masking tape and offcuts of wood from your bandsawn form, leaving you with both profiles cut and ready to be carved.

RENEWING A WINDMILL – FOR RENEWABLE ENERGY

**Marc Fovargue-Davies reports
on an ambitious project to
restore a Cambridgeshire mill**

Swaffham Prior in Cambridgeshire, isn't a village that does things by halves; not only are there two churches in its churchyard, it also has two windmills within a couple of hundred yards of each other. One, a brick tower mill, still works and is at the heart of The Prior's Flour company, while the other, a timber smock mill, has long been a private house, with the bulk of its machinery removed to make way for living space.





ABOVE: The new cap for Swaffham Prior, with the beam that will support the windshaft
 OPPOSITE: Swaffham Prior's sister mill at Wicken, showing the Cambridgeshire-style cap

The smock mill's new owner, James Forsyth, is an experienced boatbuilder with an interest in both timber structures and microgeneration; after all, it's not always easy to find somewhere to plug in a boat. His idea of a 'retirement' project turned out, characteristically, to be on a rather larger scale than most of us would want to tackle. Two years before he bought the house, the Swaffham Prior Land Trust had initiated a project of their own, designed to make the village much less reliant on expensive and polluting heating oil. Known as 'Heating Swaffham Prior', it will use ground source hot water to serve 300 homes, with electrode boilers for backup. James immediately decided that the mill should be self-sufficient in terms of energy, using air source heating, solar panels and of course, wind powered microgeneration.

Inevitably, that meant some daunting tasks ahead – there's nothing small or light about windmill components – especially the cap, which needed to be completely replaced before the mill could work again. James clearly needed some specialist help; life being what it is, he'd never quite got around to acting on his plan of taking a course at Lowestoft's International Boatbuilding Training College (IBTC); but he did know many of the people who work there, and that it also has a commercial division. The college teaches traditional and modern boatbuilding skills, both of which are highly transferable; if you can build a traditional wooden boat, you can build most things in wood – including a windmill cap. The commercial division could also move the project forward more quickly, but before they could get started, there was another problem to solve.

Although the mill's top floor will house state of the art generating

equipment and batteries, with the others continuing to provide living space, it's still a listed building, and by the 1970s, one of only three vertically boarded smock mills remaining. That means that on the outside, it must meet very strict historical criteria. As a result, plans for the new cap were drawn up by Luke Bonwick, a consultant millwright who also looks after many mills for Kent County Council; with that done, work on the new cap could finally get under way.



Internal gears are usually wooden too, often apple wood or hornbeam

Millinery...

There's a lot more to a windmill cap than meets the eye. Its job is to capture essentially horizontal wind energy and through two simple but very large (the brake wheel is just under 2 metres in diameter) gears, direct it vertically down the tower, where it can drive the machinery inside. In the process, the cap has to handle some serious loads; four 7 metre sails will be attached to the cast-iron windshaft – which itself weighs around 2½ tons, so its base must be immensely strong. Since the cap – which usually sits on top of the tower entirely under its own weight – must always face into the wind, it also has to rotate; that's where the fan-like arrangement on the opposite side to a windmill's sails comes in. It turns the cap, sails and all, on a 'curb' – a toothed iron ring – via a set of gears, only stopping once the fantail is edge on to the wind, and the main sails are facing it.

The shape of the cap's roof also matters, and local tradition plays a significant part. Lincolnshire mills often have an ogee (or onion) shape, while those in Norfolk, appropriately, given the IBTC's location close to the Broads at Lowestoft, are frequently boat shaped. Many in Kent have a waggon-shaped cap, but Cambridgeshire mills usually have a more conical shape, very like that on the Wicken windmill, another surviving vertically boarded smock mill, just across the valley and probably built by the same millwrights as Swaffham Prior. So the new roof will look very similar, though the design of the finial is yet to be decided.

Building the new cap

The base of the cap obviously has to fit the diameter of the tower, which is not always as straightforward as it sounds – the Swaffham Prior tower is octagonal, while its neighbour at Wicken has 12 sides. This has implications for the geared curb ring's diameter too, and with the old one now doing duty as garden steps, a replacement had to be made by East Coast Castings, a specialist historical foundry in Watton, Norfolk. It was cast using Tim Whiting's patterns from Billingford mill near Diss, which happened to be just the right size. The patterns for the rollers on which the cap turns, were lent by steam engineer Jonathan Wheeler, and were originally made for Bardwell mill near Bury St Edmunds. The curb wasn't the only thing borrowed from other mills; the replacement cast-iron windshaft came from a mill at Gamlingay in Cambridgeshire, demolished in 1977.

The load-bearing parts of the cap and fantail are unsurprisingly, mostly made from European oak, with the ring around the curb being constructed in two layers, half-lapped together – simple and strong. The ribs supporting the cone can be lighter, and are of Douglas fir, which will eventually be covered in a layer of larch sarking boards, under the outer roof of western red cedar, which will be finished in traditional white. The painted finish wasn't the only traditional consideration though, with Alex Hunter and Gary May, the two boat builders working on the cap, soon noting that all the rather odd looking metric measurements had clearly been converted from the original inches...

One job that won't be carried out by boat builders though, is mounting the completed cap, which will weigh around 6 tons minus its sails, on the top of the tower; that rather delicate task, is definitely one for a specialist crane operator. However, boat builders may well end up building a set of William Cubitt's hi tech (in 1807, at least) patent sails, which can be adjusted without stopping the mill.

Renewable communities

This still of course, leaves James with the question of the micro generating equipment, which, along with battery technology, is evolving



IBTC's commercial team working on the new fantail frame

very rapidly, so no final decision has yet been made. Many choices are driven by local circumstances; Swaffham Prior has not only opted for ground source heating, but has also had to deal with unusual planning issues resulting from concerns about development blocking the supply of wind to its mills, while other Cambridgeshire villages have taken very different routes. Reach has opted for its own community Solar Farm to reduce its reliance on oil, whilst Gamlingay has invested in a single, modern wind turbine. However, regardless of the final decision on the approach to renewable energy, these communities and individuals are clearly all very much switched on.

For more information about the IBTC, visit: www.ibtc.co.uk



Once complete, the fantail will look like this one at Wicken



The new curb and bearings for Swaffham Prior



Caps are elegant inside, too

A collection of various woodworking tools is scattered across a rustic wooden surface. In the top left, there's a wooden handle and a red-handled tool. To the right, a red square tool with a black hole is visible. Below it, a red and black tool with a serrated edge lies horizontally. On the left side, a black hammer with a wooden handle is positioned vertically. In the bottom left corner, a black tool is partially visible. On the right side, a large circular saw blade with a serrated edge is partially shown, along with a black tool at the bottom right. The background is a rich, textured wood grain.

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UNDERSTANDING TOOL NOISE AND VIBRATION

Acoustic designer Andrew Fermer explains how to interpret the figures on your tools and how to protect your hearing

I have often come across the commonly held view of acoustics being a dark art, and after immersion in the subject for a decade I can see how the sheer number of different measurement parameters and standards could be baffling.

Here I hope to impart an understanding of basic acoustic principles relevant to hand tools, which could be useful when interpreting the accompanying technical data. The potential effects of over exposure to noise and vibration will also be discussed, together with some simple reduction measures.

Jargon buster

Let's begin by defining the terms noise and vibration.

NOISE

Measurements of sound are usually presented in decibels (dB). Decibel sound levels use a logarithmic scale with a pressure reference value, measured in Pascals (Pa) and consequently do not behave in a conventional linear manner; a subjective doubling or halving in sound level is represented by a difference of approximately 10dB. The illustration below shows the Leq (sound pressure level averaged over the measurement period) dB values for typical everyday situations.

The most commonly used parameters for decibels are sound pressure level (Lp) and sound power level (Lw). Sound pressure is the decibel Pa value measured at a given distance from the source object and sound power is a decibel Watt value of the source itself with no distance associated.

A typical example from an instruction booklet for a cordless power drill quotes a sound pressure level of 71.5dBA. To fully appreciate this figure it is necessary to study the standard to which the tool has been measured. This will be a BS or EN Standard of which a report can be obtained online from independent companies.

Poorly maintained equipment and accessories can result in a significant increase of the quoted sound pressure level. Add to this the individual characteristics of different materials and the figure becomes an arbitrary point of reference from which the user must make a reasonable assessment of the risks.

VIBRATION

An object is considered to vibrate if it has an oscillating motion relative to a reference position. There are various parameters for describing vibration, the most common being m/s^2 (metres per second squared) which is a measurement of acceleration. It may be better understood

when phrased as 'metres per second per second'; in other words the increase in speed (in metres per second) that is achieved each second. In this instance, higher m/s^2 values mean a higher magnitude of vibration would be expected from the tool.

Noise regulations

The Control of Noise at Work Regulations 2005 details noise limits that require control measures (including the use of hearing protection) to be implemented by employees and provide useful guidance for the noise levels at which hearing protection is advisable.

An 'exposure limit' value of 87dBA is advised; if this noise level is ever reached then action should be taken to reduce the level for the protection of hearing to below 85dB – indicating the wearing of ear defenders, for example. However, a level of personal protection below 70dB should be avoided as this will affect the user's ability to communicate and to hear warning signals.

Hearing deteriorates over time for everybody; however, exposure to noise over certain levels can exacerbate the process. Presbycusis is the medical term for the natural cumulative effect of ageing on hearing. While not preventable the severity of the condition can be managed by implementing safe working practices as standard procedure for many of the common operations performed in the workshop. Like some respiratory conditions, the effects are often felt long after the initial damage is done.

Another detrimental effect that could possibly be caused by exposure to loud noise is a condition called tinnitus (from the Latin word for ringing). Tinnitus is the perception of sound inside the head in the absence of any external sources. It is usually perceived as a ringing noise, but in some cases it can be a high-pitched whining, buzzing, hissing, humming or whooshing and can be very distressing for the sufferer.

As such, consideration should always be given to the use of hearing protection for noise levels in excess of the guidance within the Noise at Work Regulations and for levels below the exposure limit level if loud tools are being used for a long time.

Vibration regulations

The section of the Control of Vibration at Work Regulations most relevant to WWC readers relates to hand/arm vibration syndrome, a generic term used to describe a variety of injuries to the hands and arms caused through excessive exposure to vibration. It can be developed through the repeated use of hand-held vibrating tools and regularly holding or working with equipment that vibrates.

Sufferers experience bluish discolouration (cyanosis) of the fingers and hands and/or a whitening of the fingertips after cold or damp exposure. Numbness – with or without a tingling sensation – usually accompanies this. Symptoms that are more common in winter may eventually occur all year round. Sense of touch and pain perception may be reduced, sometimes permanently.



A vibration meter will give readings for hand/arm, white finger and whole body vibration situations

The Control of Vibration at Work regulations also provide exposure values above which action should be taken. These levels are a limit value of 5m/s^2 and a daily average exposure value of 2.5m/s^2 .

Other than the reduction in length of time tools are used, and/or the use of tools with less vibration, the currently available measures to reduce exposure are limited. Anti-vibration gloves are generally not effective in reducing the amount of vibration transmitted to the hands and arms.

In recognition of this, manufacturers are incorporating materials with a dampening effect to reduce exposure. I would suggest that this be taken into account when considering the purchase of a tool that may well be used for long periods of time. Key examples would be random orbital sanders, jigsaws and hammer drills. However, gloves may prevent vibration injury by keeping the hands warm and dry when faced with a cold and damp environment.

It is possible to hire equipment to carry out an assessment of hand-held tools and larger machines. A device such as this is a sophisticated piece of equipment capable of generating a wide range of data, which in itself can be more of a hindrance than of any real help if the information is not interpreted correctly. Although a wealth of information is available on the HSE website, including a facility which will enable you to calculate exposure limits, the services of a professional practitioner should be sought by employers.

Standard EN60745

The EN60745 standard will often be referenced when tool manufacturers are detailing sound and vibration performance. It standardises measurement procedures and parameters and as such means that the noise/vibration levels quoted for different products using the standard should be comparable.

The sound pressure decibel and vibration acceleration figures for products quoted against this standard could also be used as a rough preliminary

Noise – a general rule of thumb



Remote countryside daytime 20dB



Kettle boiling approx 50dB



Busy office approx 60dB





Look for ear defenders with a single number rating (SNR) of around 20

guide in reference to the noise and vibration at work regulations' limits and associated requirements for action/hearing protection.

However, while useful for obtaining indicative exposure estimates, these manufacturer levels generally would not be sufficient for an official assessment for a real employer/employee situation. This would usually require actual measurements and calculations undertaken by a qualified acoustician of the tools in use.

The Institute of Acoustics (www.ioa.org.uk) is a professional body of registered members able to advise on such matters. The Association of Noise Consultants is a similar organisation. Many of its members offer site surveys and a visit to their website at www.association-of-noise-consultants.co.uk will enable you to search for a consultant in your area.

Safeguarding yourself

Undertaking a full noise and vibration at work assessment can be a complicated exercise, but the hand-tool user can take some simple steps to reduce exposure.

Ear defenders are an easy and effective way to cut health-damaging noise levels but measures to reduce exposure to vibration are limited. The general acoustic environment of a workshop can be improved by reducing the reverberant build-up of noise which can be caused by having hard finishes in the room.

One way to introduce absorption into a workshop space would be through the use of evenly distributed acoustic panels to any hard wall areas. A simple absorbing panel suitable for a workshop could be constructed with 50mm of mineral wool held in a frame behind a perforated wood, or metal retainer with an open area of 23% or more. Panels like this could easily be incorporated into stud wall partitions as part of a workshop layout. Generally, the greater the number of panels evenly distributed on the wall area, the lower the reverberation time will be in the space, thus resulting in a more pleasant acoustic atmosphere.

The drawback with this solution is likely to be from a build-up of dust which inevitably will reduce the effectiveness of the device. Routine maintenance of such a device should therefore be carried out as part of your regular workshop housekeeping.

Creating a barrier

In addition to the tool users, hearing damage to non-users should also be considered. By far the best solution to combat levels of noise likely to be harmful to non-users of the machine or tool being operated is to create a physical barrier. An acoustic enclosure could be constructed from a variety of materials, the general rule being that the greater the mass of the material the greater the sound reduction afforded. It is also important to ensure air gaps are sealed or properly acoustically treated (for example, with ductwork for ventilation purposes). In many workshops, machinery is separated from build space for economy of labour but the advantages for implementing this could be extended to a smaller setup as well.

A full assessment of noise levels would not be complete without taking into consideration the environment beyond the workshop. The benefits of insulating the walls, floors and ceilings extend to soundproofing, and retro fitting of an acoustic lining may not be as difficult as you think.

Maxiboard is a sheet material 17mm thick that will take a screw, or a nail, and is sufficiently impact resistant to withstand workshop activity. Suitable for use on walls, ceilings and between floors, it can also be used to form independent structures or enclosures. For external or adjoining walls the acoustic performance can be improved by as much as 14dB depending on the existing structure.

Hearing protection

Hearing protection apparatus is measured using a single number rating (SNR) of around 20. The SNR figure is the amount of reduction in decibels that the apparatus will provide. Based on the figures shown below, an operator using this equipment should be wearing apparatus with an SNR of at least 20 to achieve a safe level of protection. The current standard to which ear defenders are tested is BS EN352-1:2002.

A simple spreadsheet calculator on the HSE website at www.hse.gov.uk/noise/calculator.htm, helps you establish the necessary criteria to manage your exposure to noise and I recommend you take a look. It is by far the easiest way to assess the dangers and therefore take the appropriate steps.

Typical noise data for machines with no noise reduction measures	
Machine	Noise level (dB)
Beam panel saws and sanding machines	97
Boring machines	98
Band resaws, panel planers and vertical spindle moulders	100
Portable woodworking tools	101
Bench saws and multiple rip saws	102
High speed routers and moulders	103
Thicknessers	104
Edge banders and multi-cutter moulding machines	105
Double-end tenoners	107

Pretty much every machine used in the workshop exceeds the permissible noise levels set out by the HSE

Expect a thicknesser to create 104dB

A router operates at around 103dB

Bench and tablesaws have a typical level of 102dB

Band resaws, planers and vertical spindle moulders have a typical level of 100dB



Rock concert / night club approx 120dB



Threshold of pain approx 130dB



Jet engine taking off approx 140dB

80

90

100

110

120

130

140

150

FLUTED BOWL

Nic Westermann carves a freestyle
fluted bowl from unseasoned birch



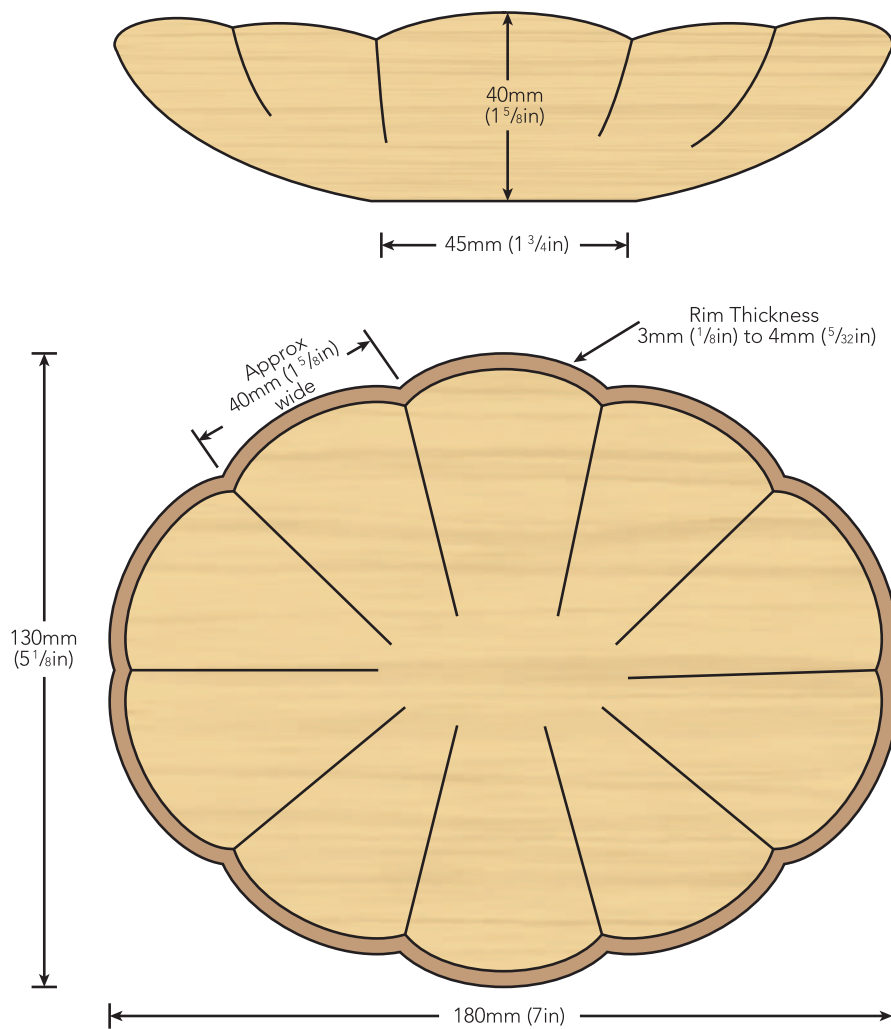
My background in green woodworking means I take a relatively unplanned approach to my carvings; this became more apparent to me as I tried to record the process for this article. For me, carving is about using the wood I have available, which means my starting point is a log with the bark still on. In this case as it had been outside for just over a year it was starting to spalt. This made for a more interesting grain pattern, but again meant I had to adjust my design to suit what I found as I progressed. However, if you prefer to use sound, planed, seasoned timber then the process would still be very similar.

An Arbortech and/or bandsaw could also be

used instead of the axe and adze to rough out the bowl. I don't feel there is any right or wrong way to work; whatever feels safe and enjoyable to you. However, for me, this means using hand tools, removing as much of the waste with the axe and adze as possible before moving on to knives for the finishing cuts. I keep my tools very sharp and aim for a smooth but faceted tooled finish with no sanding. Also, if a piece doesn't work out as expected, I tend not to rework it, preferring to start a new piece. This may be a hangover from my blacksmithing work. With forgework it is better to work quickly and boldly, completing a piece as efficiently as possible; mistakes can rarely be rectified completely.

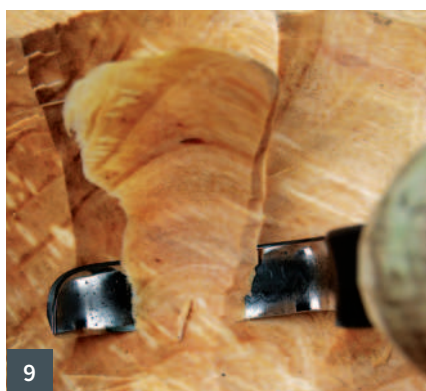
YOU WILL NEED

- Birch wood: 300 x 175mm
- 300mm froe
- Carving axe
- Adze
- 50mm-diameter bowl adze
- Bowl gouge or bowl knife
- Laminated carving knife
- Detail carving knife



Carving the bowl

- 1 Your starting point needs to be a birch log. As mentioned above, my log had been outside for a long time and was spalting almost to the point of being no longer usable. It was obviously not green, but as it was wet it cut very easily. Cleave the log in two with a froe with the split running just missing the pith, which is best avoided. You could easily use the axe if you place it on the log and drive it through with a maul or mallet.
- 2 You need to use the cleft face as the natural edge of the bowl, so try to keep this clean as it is hard to tidy up later. If you want to draw an outline of the bowl, make sure that the lines will be removed as you work down to the final edge thickness of 4mm.
- 3 Rough the bowl out with an axe, removing all the bark and in this case some soft rot that had progressed through a wound in the bark. Cutting all this away will dramatically reduce the width of bowl you are able to make.
- 4 Roughly shape the back of the bowl to its finished size with help from the axe.
- 5 Wedge the bowl blank in a bowl block, or whatever holding device you have available. In this case some waste wood was wedged underneath to raise the bowl up to allow easier access.



PHOTOGRAPHS BY NIC WESTERMANN

- 6** Use an adze for the initial shaping, working from the centre outwards; I find that flutes tend to form naturally and it is just a case of enhancing them rather than trying to remove them. However, it may well be easier to mark out roughly where you want them to be. At this point you can see some of the flutes developing.
- 7** As you get close to the edge of the log, if you are unsure of your accuracy when swinging an adze, this unconventional method of cutting may be a useful way to refine the flutes.
- 8** Here you can see the level of finish possible after using the adze.
- 9** Use a bent knife – or twca cam – to further clean up the flutes. A curved gouge could be employed here to equal effect; what is most important is that whatever tool you choose matches the radius of the adze. At this point I got carried away trying to get the perfect photograph of a finishing cut into the end grain of the wood. This has the unfortunate effect of making my already slightly too narrow bowl even longer.

- 10** This is the level of finish possible with a twca cam. It is quite tricky to do the centre; I tend to let the ridges fade out rather than have a complex intersection right in the middle of the bowl.
- 11** You can now remove the bowl. In my case, as I had gone quite deep, the thinnest spots were marked with a pencil. I stayed clear of these with the axe.
- 12** Next, reduce the wall thickness of the bowl to be roughly the same as the thin spots marked with pencil – I did this by guessing that towards the base the thickness was less than 10mm.



- 13** You can now roughly hew the bowl to size. It is viable to finish with a knife at this stage. You can also check that the bowl sits level. If it doesn't, remove wood from the base until it does.
- 14** With care, use an axe to remove the wood here, as when used properly, it can be a very accurate and efficient way to remove wood. I was able to cut the external flutes to save time, removing a lot of wood with a knife. It is easy to go too far with an axe and it is infinitely better to change down to a knife sooner rather than too late.
- 15** Here is a top view of the final finish possible with an axe.
- 16** Take finishing cuts with a larger carving knife; I work the entire outside surface of the bowl aiming to keep the wall thickness at the natural edge to 4mm. Gently blend in the flutes on the outside rather than take them all the way down to the base.
- 17** Cut the sharper inside returns with a narrower detail blade, which turns much more easily. Your aim is to finish the bowl at this stage so that sanding is not required. However, if the

- bowl does need sanding, I would hold off for the time being.
- 18** Hollow the base slightly. The wood is still wet and may move slightly on drying. You will find it is much easier to re-flatten a hollowed surface.
- 19** The bowl is now ready to be dried. A problem I struggle with is dirty finger marks. A tip I picked up from fellow carver Peter Benson is to wash the bowl in soapy water with a nailbrush. It won't raise the grain on cut wood. Dry with a paper towel, then wrap in two sheets of newspaper and leave to dry indoors. Unwrap after the first couple of days and if there is any hint of cracking, soak the bowl in Danish oil. Keep wrapped for a week or until you feel it has dried, which will depend on the species of wood. This bowl dried with no cracking or warping; spalted wood seems to have less tension in it and rarely gives problems. Lightly sand with fine abrasive for a final clean-up followed by a couple of coats of Danish oil to finish it. My bowl didn't quite turn out as I wanted, but there is always the other half of the log if things go completely pear shaped.

HAND PLANES

PHOTOGRAPHS BY ANTHONY BAILEY/GMC PUBLICATIONS



Matt Long presents all the information you need about working with hand planes

Most woodworkers are familiar with the standard smoothing plane, consisting of a wooden or metal casing with front and back handles, and some method of holding a sharp steel blade at the appropriate angle to produce the cleanest cut. The plane will have some method of moving the blade up and down so that the depth of cut can be regulated.

There are, however, many different types of plane. They can be tiny – such as those used for instrument making – or very large indeed, such as the shooting plane – up to 660mm (26in) long – used for ensuring long lengths of timber are as flat and smooth as possible.

And the variations in between are almost endless – they include: jack, fore, jointer, smooth, block, low angle block, rabbit/rebate,

edge trimming, bull nose, plough/combo, circular, router and palm, to name but a few.

I'll start off with the most basic planes you'll need, and then veer off slightly into the realms of the exotic – you'll find that if you get a taste for using planes, you can very easily get carried away buying a plane you'll only really use infrequently, but to the woodworker they are very often objects of desire!

Whatever material they are made of, and however much you have paid for one, there is nothing as satisfying in woodwork as sharpening and setting up a plane so that it removes the thinnest of shavings, effortlessly.

But first, let's take a look at the components of a plane.

Anatomy of a plane



A The mouth is an opening in the bottom of the plane down through which the blade extends

B The iron, or blade, is a plate of steel with a sharpened edge that cuts the wood

C The lever cap holds the blade down firmly to the body of the plane

D The depth adjustment knob controls the depth of cut

E The front handle helps to push down the plane's nose when starting the cut, and guides plane direction

F The cap iron gives the blade more rigidity and breaks apart wood shavings as they pass through the mouth

G The lateral adjustment lever adjusts the blade to ensure consistent depth of cut across the plane width

H The rear handle provides most of the thrust for the plane

I The frog is a sliding iron wedge that holds the plane iron at the proper angle. It slides to adjust the gap between the cutting edge and the front of the mouth. The frog is screwed down to the inside of the sole through two parallel slots and on many planes is only adjustable with a screwdriver when the plane iron is removed

Sharpening a plane

To get the best use out of your plane you will have to, at some point, invest in sharpening equipment. This will be a good investment, as sharpening is an essential skill to keep your plane working. The equipment will also sharpen other tools such as chisels.

Your first outlay should be on an oil stone. When bought new, your plane will benefit from having its edge honed. Your blade will have a bevel ground on the cutting edge, which will need extra honing with the use of the oil stone. In effect you will get two angles on your blade: the ground bevel, and the honed one.

When using an oil stone, always ensure the stone has plenty of oil,

and always hone over the entire length and width of the stone, to ensure even wear of the stone.

As time goes on, and after continual re-honing of the blade, you will find it harder and harder to get a good edge on the blade, as the honing angle eats into more and more of the ground angle.

At this point, you will need to regrind the blade. Here a watercooled rotating stone grinder is your best option, though expensive if you are starting out. Alternatively, you can get a normal dry grinder, though overheating of the blade, and keeping your blade square, make sharpening more difficult.

Types of plane



1 A smoothing plane **2** A Stanley No.5 Jack plane made of a cast-iron bed with steel, brass and wood components **3** A wooden Jack plane made by Phil Edwards of Philly Planes **4** An antique Stanley No.32 transitional jointer plane, which is a whopping 660mm (26in) long **5** A Veritas DX60 block plane with a bed length of about 165mm (6½in) **6** A bull nose rebate plane

SMOOTHING PLANE

These are generally the shortest of the two handled planes. The standard length is 225–250mm (9–10in) long with a blade width of 45–50mm (1¾–2in). Smoothing planes are intended for general work. The plane is still light and short enough to use with one hand when necessary.

JOINTER OR TRY PLANE

These are the longest of the hand planes and normally have lengths from 455–560mm (18–22in), although antique jointer planes can be between 660–762mm (26–30in) long. Blade widths are the same as a Jack plane at 50–60mm (2–2 ⅜in). Because of their long length they ride over any depressions, helping to flatten the board.

STANDARD BLOCK PLANE

These small planes are intended for one-handed use. They have a slightly lower blade angle and are used on end grain. When cutting end grain it is best to use an angled shearing cut. Block planes are also ideal for general-purpose work and work well for chamfering because of the high degree of control.

LOW-ANGLE BLOCK PLANE

These planes have the same basic design as a standard block but with a lower blade angle of between 12 and 14° – this makes them work even better for end grain and they can also plane composite materials and laminates well. Care must be taken when working on the flat of the board with these planes because the low angle will catch and lift the wood fibres instead of shearing them off.



7



9



10



8



11

REBATE OR RABBET PLANE

These planes range in size from 100–330mm (4–13in) long with blades 25–54mm (1–2½in) wide. The blade extends to at least one side – often both sides – of the body, allowing the planing of rebates, etc. The bull nose version of these planes has the blade right at the front of the plane so you can work in a blind or stopped groove or rebate.

COMBINATION OR PLOUGH PLANE

These planes can do it all. The antique versions are made of steel and wood, and fetch high prices. Modern versions have metal bodies and composite handles. They have straight blades ranging from 3mm (¼in) up to 45mm (1¾in), but also beading, reeding, fluting, tongue and groove, and even sash cutters. Often a separate cutter is set into

7 A Clifton rebate plane 8 A very old Stanley No.55 combination plane 9 A Lie-Nielsen scraping plane. Note that the plane blade slopes forward, meaning this is, in effect, a cabinet scraper – a steel blade with a burred over edge which removes very fine shavings 10 Once ground, use a quality oil stone to hone the cutting edge 11 This old block plane blade needed re-sharpening and had to be reground. The secret is to square the edge of the blade by flattening the end against the grinding wheel. Then, holding your finger across the blade, use this as a guide so you are grinding one angle – about 25° – on the blade 40°

the plane nose, which slices the grain before the main plane blade contacts the wood. They normally come with a guide fence, which helps to keep your planing at 90°.

So, that's my round up of some of the planing options available.

For a basic toolkit, you'll probably only need to start with a smoothing, Jack and block plane, but as your skills improve, you'll probably want to try out some of the other options depending on the job you are doing.

Front porch

James Hatter builds a front door entrance and discusses ways this construction can be adapted for personal requirements



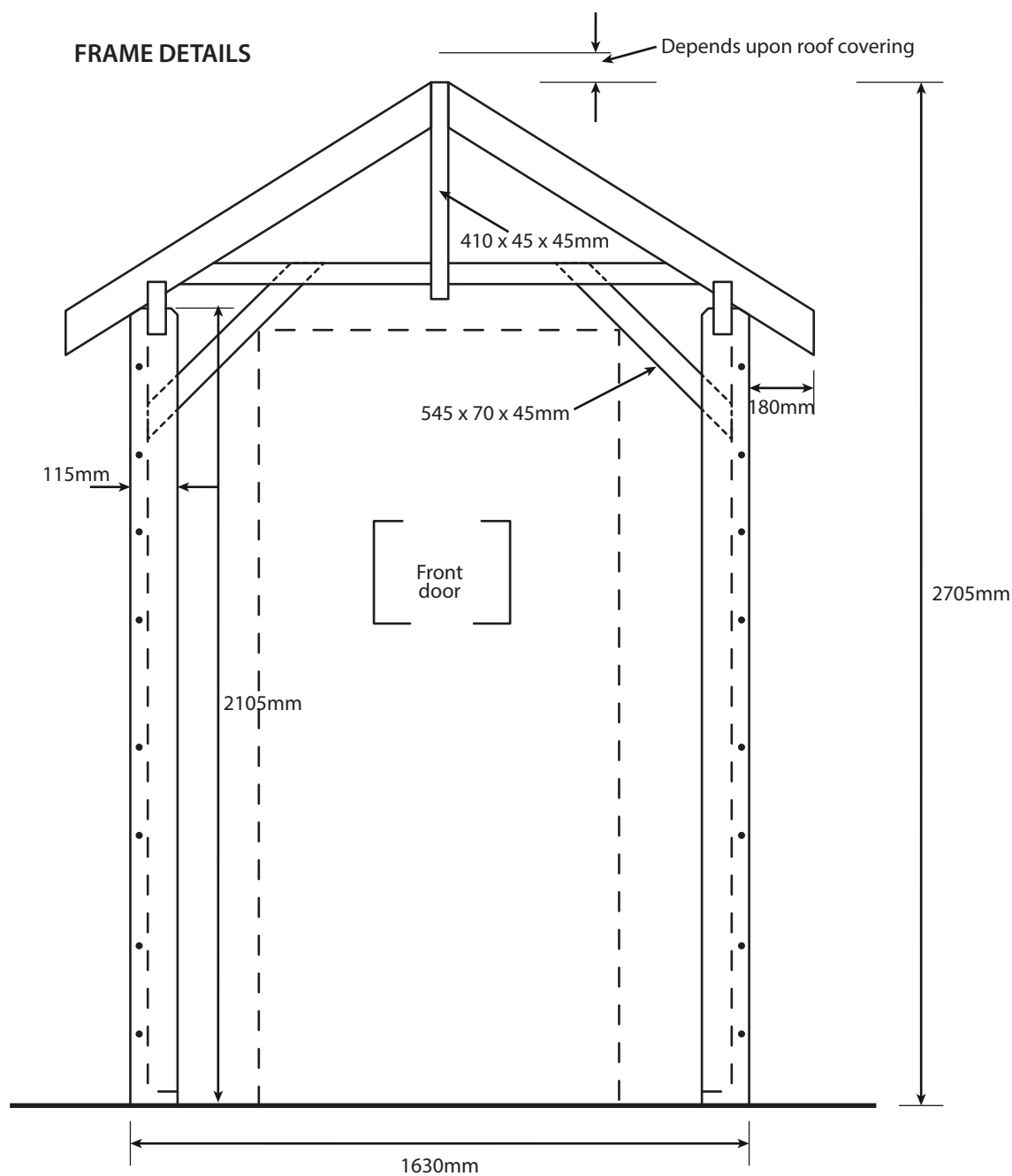
This porch has overall measurements of 2,300mm wide, 2,820mm high and 975mm deep, the basic frame being 1,980mm wide, 2,705mm high and 850mm deep. This size matches a paved step to the front door, which acted as the base. The porch has a simple pitched tiled roof, with front legs and rear legs attached to the house wall. It has an open front and sides, apart from a low shelf on either side with rails below. The front legs are attached to the base using coach screws into plastic plugs. Bracing timbers are included to give the frame stability. The prepared timbers are coated with an exterior grade wood paint, and most of the finish is painted onto components prior to assembly. Pre-painted OSB is used

over the roof rafters, then roofing felt, battens and tiles cover this.

The porch replaced a decorative wooden neo-Georgian fascia that surrounded the front door. This fascia had deteriorated, despite regular painting, and did not provide any protection from the weather.

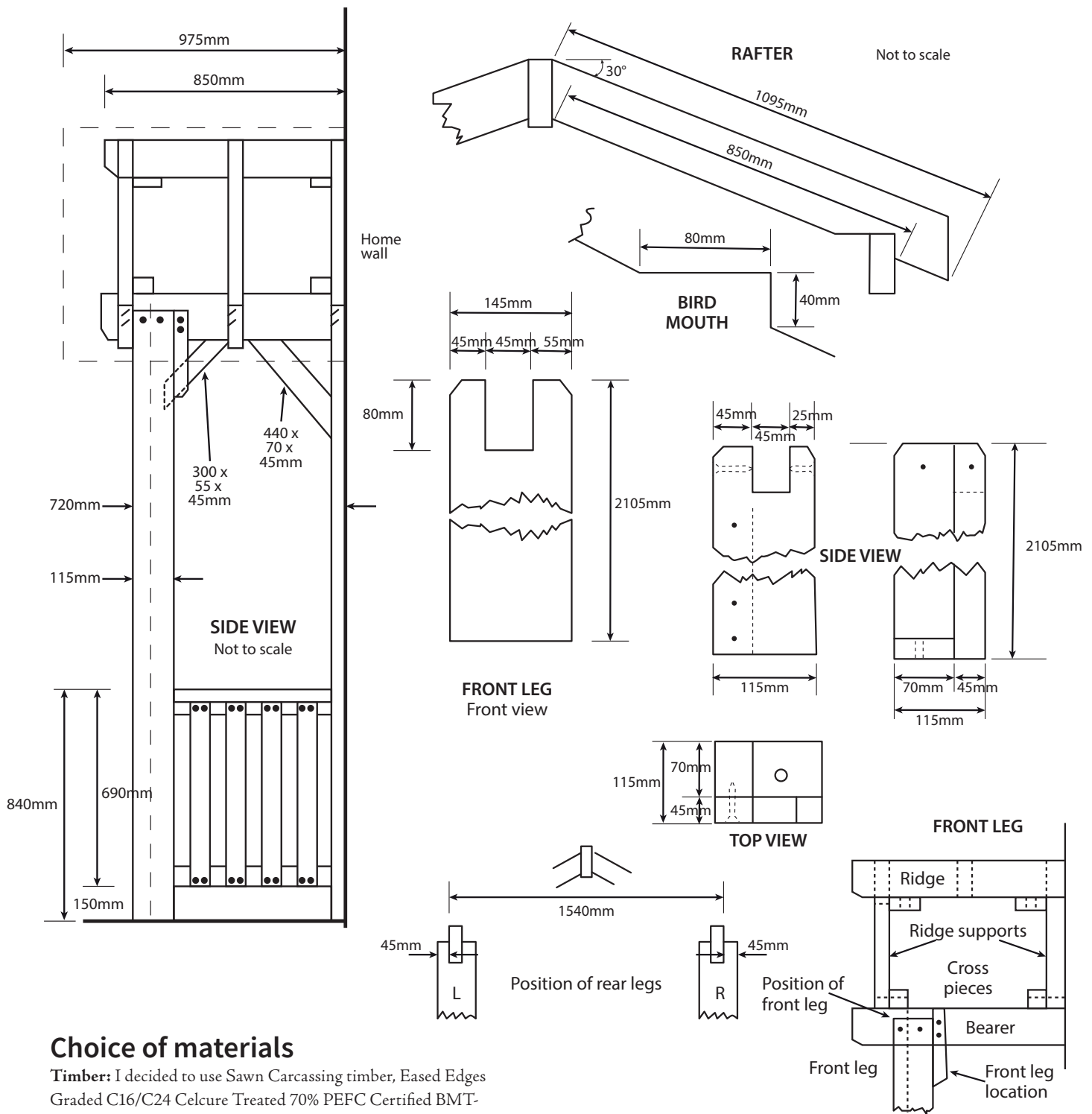
Safety notes

Working at height always involve the need for safe working. A scaffold tower was used for this project, which provided a secure platform for working. It is advisable to ensure hands are well washed following handling of treated timbers, and caution with dust is also advisable.



FRONT VIEW

Not to scale



Choice of materials

Timber: I decided to use Sawn Carcassing timber, Eased Edges Graded C16/C24 Celcure Treated 70% PEFC Certified BMT-PEFC-027, because this is weather protected, was available in a range of sizes and has a reasonably smooth surface. An alternative would be oak, which would be attractive and long lasting, but would also be much more expensive.

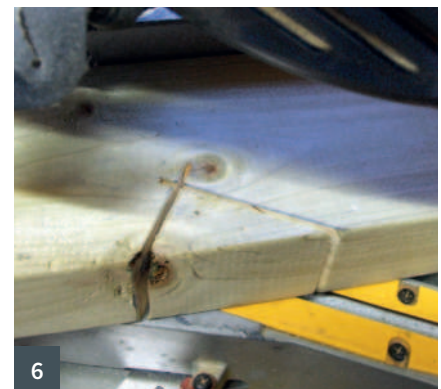
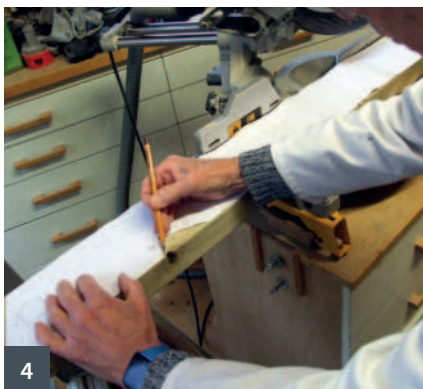
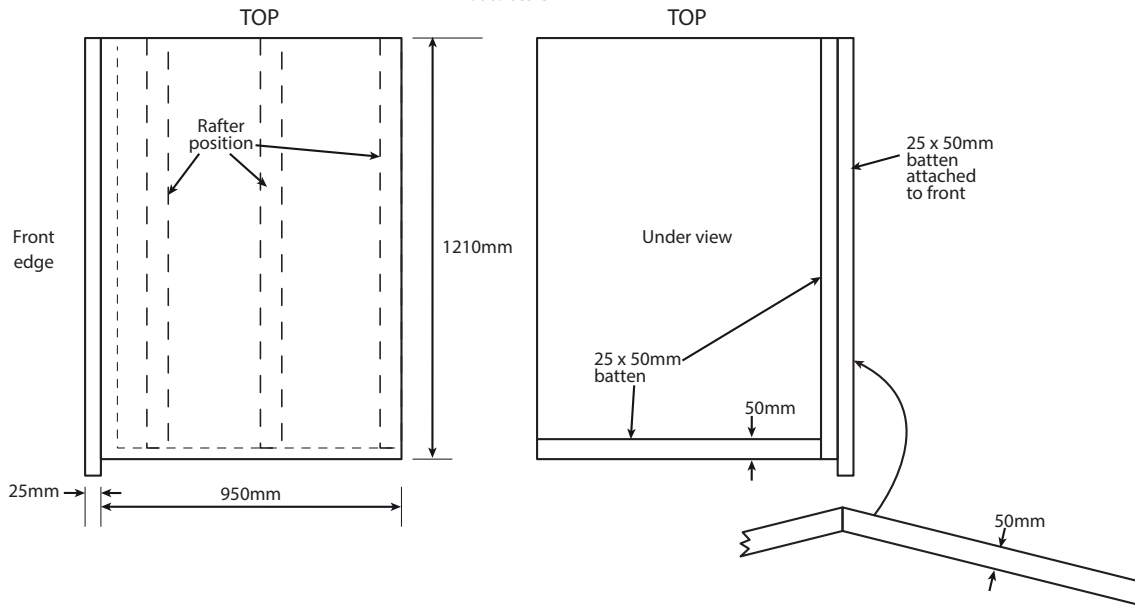
Roof: The choice of roof material may be influenced by roofing used for the house; for this project I used concrete interlocking tiles, undercloak and underlay support trays. Other alternatives would be slates, cedar shingles, asphalt shingles and fibreglass roofing.

Means of joining: Exterior grade 5mm wood screws were used to attach the pieces together, and to the wall. 6mm coach screws were used to attach the rear rafters to the wall, and to attach the bottom of the front legs to the base.

Finish: The timber used had been treated and would weather well without any further protection. However, there are markings on the timber indicating its grade, so adding a paint finish can cover these and provide additional protection. A range of different protective finishes are available such as garden furniture paint and shed and fence paints. The one chosen for this project was Ronseal Fence Life Plus in the Slate shade. It is water based and claims to protect for five years. The other advantage of this product is that the timber does not have to be absolutely dry to use, a useful bonus as this porch was started during a wet spring.

ROOF PANEL DETAILS

Not to scale



PHOTOGRAPHS BY JAMES HATTER

1 The original fascia was attractive but badly deteriorated, and offered no protection from rain **2** Removal fortunately exposed reasonable brickwork. The area was cleaned with a power washer **3** Following measurements of the intended porch position, a drawing was made and a rafter pattern was cut using paper **4** The paper pattern was laid on a rafter piece and traced **5** The rafter was cut to length with correct angles at each end **6** The bird mouth was then cut out. This can be achieved using a hand saw or jigsaw

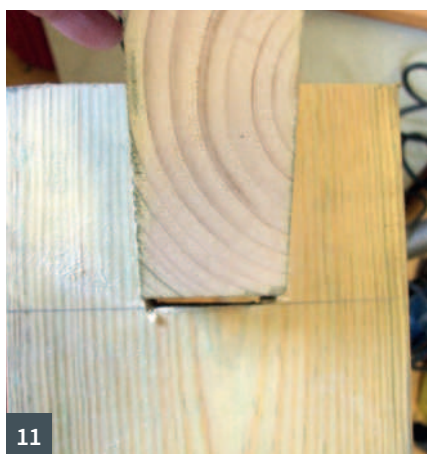
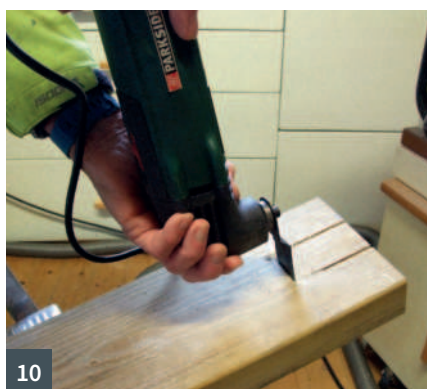
Initial plan of work

Inspect the area to be covered. Look out for any obstacles as these might govern the size possible and the strength of the base. Be aware that you may have to check with your Local Authority to see if there are any restrictions. Decide on the size required: the sizes given in this project cover a standard front door, and the depth chosen to give

adequate rain protection without reducing the light into the house.

Constructing the roof section

The rafters are made using 120 x 45mm timber, cut slightly overlength (1,200mm). Cut the ridge timber and bottom bearers to length, these use 850 x 145 x 45mm timber. Cut two cross supports using 1,540 x



7 You can use this rafter as a master for the others. Test the first two rafters before cutting the remainder **8** Cut the ridge, bearer pieces and two cross pieces; drill holes for attaching screws, and do a test assembly **9** Attach an upright to the front and add lengths along the front of the front cross piece. Also make an upright to the rear (not shown in this picture) **10** Cut the legs to length, and at the top of each, cut a socket to hold the bottom of the roof bearers. A multi cutter is useful for this **11** Test fit, and adjust if necessary **12** Measure the positions on the wall for the rear legs. Temporarily assemble the rear rafters and use offcuts for the ridge and bearer pieces. Mark and drill for attaching screws **13** Each front leg has a length of timber attached to its rear outer edge, to give a perspective of width. Also, a block is attached to the bottom, for attaching the leg to the base

45 x 45mm timber. On one rafter length, mark the positions for the end angles and bird mouth – I used a paper pattern for this. Cut the end angles; mine had a 30° angle roof slope. The bird mouth can be cut using a hand saw or jigsaw. Use the cut rafter piece and transfer the marking to another length. Check that the rafters cut produce the required roof shape and measurement. Cut the remaining rafters using the first cut rafter as a template. Six rafters were used in this project.

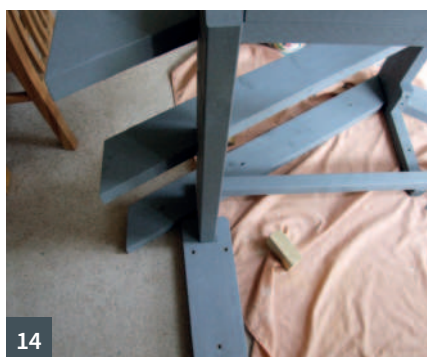
Attach the cross pieces to the tops of the bottom bearers, the rear one 45mm in from the rear of the bottom bearer, and the other 135mm from the front of the bearer. Make up the front and rear ridge piece supports using 45 x 45mm timber; the rear is 375mm long with a 110mm length attached to the front of the top, and the front is 410mm long, this is slightly longer as 35mm projects below the cross piece, this also has a 110mm length attached to the top. The front and rear ridge supports are attached midway along the rear cross pieces, the rear to

the rear and the front to the front. Pre-assemble the pieces and attach the ridge timber to the front and rear supports. Next, attach the rafters using 5mm x 100mm screws, the rear rafters are attached behind the rear cross piece, whereas the front rafters are attached in front of the front cross piece. A 45 x 45mm fill-in piece is added either side of the front cross piece, this will bring the effective cross piece level with the front of the front rafter.

Identify each piece of the roof structure and disassemble. This is an ideal time to apply a finish to each piece. I applied three coats of paint to each piece.

The legs

The rear legs are each made from a 2,105mm length of 145 x 45mm timber. At the top of each leg is cut a 45mm wide x 80mm deep slot, 45mm from the outer edge. The slots can be cut using a jigsaw or a



14 Cut off the corners at the top of the legs so that the rafter is unobstructed. Note that the members in this picture have been painted, do this to all members as convenient **15** Mark the position of the front legs of the roof bearers, attach a locating piece to the rear of the front leg (not shown) **16** All parts are now ready for final assembly. Position and attach the rear legs to the wall, rest each leg on a suitable waterproof spacer. That will apply to the front legs as well **17** Preassemble the roof bearers and cross pieces. Ensure the assemble is square **18** Lift the preassembly and slot into the top of the rear legs. Temporarily support the front with a length of timber **19** Fit each front leg into position, and ensure legs are plumb **20** Add the ridge piece

multi cutter. The front legs each use a 2,105mm length of 115 x 45mm and attached to the rear of the outside edge with a 2,015mm length of 70 x 45mm timber. A 45mm wide x 80mm deep slot is cut, 45mm from the outer edge.

At the bottom of each front leg, attach a block with a pre-drilled 10mm hole, which is used to anchor the bottom of the front leg to the base. The top corners need to be cut off so that they do not snag the rafter overhang. Drill holes to attach the legs to the roof bearers, also drill holes to attach the rear legs to the wall. The holes can be counterbored to take wood plugs if preferred.

The legs can now be painted in preparation for final assembly.

Final assembly of the frame

A useful aid to ensure accurate placement of the front legs is to attach a locating timber to the outer of each bottom bearer. This is a 250 x 45

x 45mm piece of timber, which is attached so that the front edge of the front leg lines up with the front edge of the front cross piece.

Attach the rear legs to the wall, using the location previously temporarily determined. Assemble the cross pieces to the top of the roof bearers, and attach the ridge supports to the cross pieces. Ensure the assembly is square using scraps of timber to hold it square, and add the front leg locating piece. Lift this assembly and place the roof bearers in the slots of the rear legs. Hold the front in position by clamping a length of timber to the front. Fit the front legs in position, ensuring the legs are plumb. Use a 10mm masonry bit to drill into the base, insert a plastic plug and use a 6mm coach screw and washers to secure the bottom of the front legs. Alternatively, you could use a frame fixer.

The roof covering

This project uses interlocking concrete tiles, but the initial covering



21 Use a masonry bit, to drill a hole through the lower wood block into the base **22** Use a frame fixer or a coach screw and plastic plug, and tighten to secure the bottom of each leg **23** Attach the rear rafters to the wall using coach screws and plugs **24** Attach the remaining rafters **25** Cut two pieces of OSB to size, pre-paint and fit to rafters using screws. Add batten size strips to the lower and front edges **26** Seal the rear of the board to the wall using silicone **27** Cover the boards with roofing felt, add Undercloak strip to the front, then attach battens to hang tiles

can apply to other alternative coverings. I used 11mm OSB to cover the rafters and provide over cover. Two panels each 950 x 1,210mm are used. It is advisable to pre-paint the panels prior to fitting. I used a cream exterior paint on the inside surface.

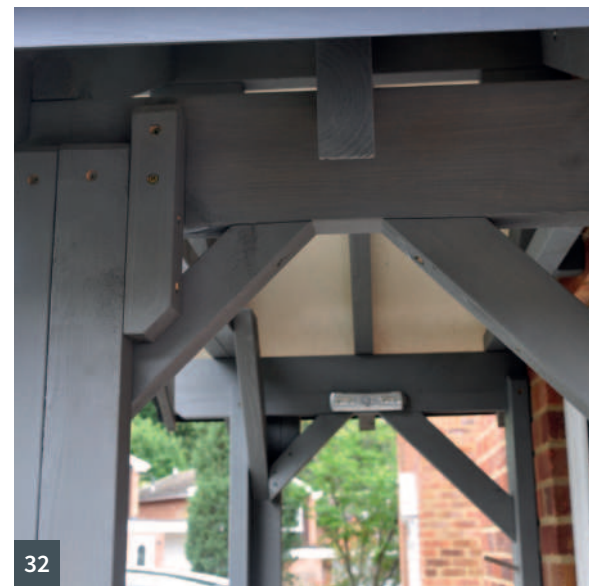
Along the inside bottom edge and along the inside front, 25 x 50mm batten is attached. Lift one panel to cover one side of the roof structure, attach with screws through to the rafters. Repeat for the other side. Attach 25 x 50mm batten along the front edge. Seal the join between the rear of the panels and the wall with silicone.

For tiles, attach an Undercloak each side with a 30mm overlap from the front roof panel edge. Also attach a felt underlay tray along the bottom of each roof panel. The tiles I used required support battens spacing of 234mm to cover each side leaving 40mm at the top, which will be covered

by the ridge tile. Screw the battens in place using screws through to the rafters below. The tiles are attached from bottom to top, and attached to the batten by hooking over batten, and using roofing nails to secure. Lay so that the tile joints are staggered. The front edges use metal clips where they overlap to further secure. The ridge tiles are cemented in place, and the front edge gaps between the top of the Undercloak and the bottom of the tile edges. Traditionally, a flashing is added to seal the wall to roof join. I didn't use that for this project but it's worth considering if you live in an exposed area. Gutters could also be added.

Extras

The frame can benefit from having angled struts at the tops of each corner. The side space has a shelf and rails included.



28 Hang chosen tiles and secure using nails. Stagger the joins **29** The tiles are taken to the ridge. Finish off the roof by adding ridge tiles **30** The sides of the porch can have attachments as required **31** The front of the tiles is ready to be filled with mortar. Metal clips are added for extra security **32** The frame is made stable by adding angled struts to the corners **33** View looking at ridge piece and associated timbers **34** Front leg locating piece. The front of the leg lines up with the front edge of the front cross piece **35** The finished porch

KIT & TOOL NEWS

Find out about the latest product releases



CLARKE ELECTRIC BAND SAW WITH STAND

Designed for DIY and hobby use, the Clarke CBS250C 255mm Electric Band Saw with Stand allows for accurate cutting in all types of wood and suitable plastic materials. Its tilting table and parallel fence provide the facility to produce accurate straight, cross, rip, mitre and bevel cutting. For added stability, the CBS250C includes a workstand, providing a comfortable working height.

The bandsaw is also supplied with a stand kit, push stick, work table, parallel fence, 5mm, 4mm & 3mm allen keys, 10mm Open and 13mm Slotted Ended Spanner and fixings.

www.machinemart.co.uk

CLARKE EXTRA HIGH OUTPUT DRUM FANS

These extra high output drum fans provide fast, efficient cooling in large workshops and garages. The fans produce an excellent amount of air flow, up to 455m² per minute, allowing large areas to be cooled quickly and efficiently, with three large fan sizes to choose from: 60cm, 76cm or 91cm.

All models include two handles and are mounted on large rubber wheels for easy transportation. They feature a robust steel frame and steel guard for safe operation, two-speed control and a durable painted finish.

www.machinemart.co.uk



MAKITA POWER AND GARDEN TOOL DEMOS

Makita has relaunched its popular product demonstrations of its 40VMax and 80VMax XGT power tool range and for the first time, users are also able to get hands-on with the range of cordless garden machinery products.

Professionals are now able to arrange Covid-secure appointments with an experienced Makita team member to try out its range of cordless power equipment. Demos are available for either its 40VMax or 80VMax XGT range or the cordless Outdoor Power Equipment (OPE) range, with both offering guidance on tool and accessory selection, as well as hands-on testing with the tools of your choice.

Cordless 18V and 36V LXT and 40VMax and 80VMax XGT garden tools, lawnmowers, linetrimmers, hedge trimmers, blowers, chainsaws, will all be available to test, as well as many more. The 40VMax and 80VMax XGT system of cordless tools have been designed to offer the power and performance needed to tackle high-demand applications without compromising battery run times.

The product demonstrations will be organised locally with Covid safety protocols in place, so Makita staff will arrange to visit you on a mutually convenient date where you can test selected machines. Each tool will be cleaned before and after use and our staff will be wearing masks and implementing social distancing.

www.makitauk.com

SWEDISH WOOD IN HIGH DEMAND

Wood products from Sweden are currently in high demand but producers have warned that supply is limited. Despite full production and manufacturing records in March, Swedish sawmills currently have their lowest stock levels for over 20 years, which has put pressure on sawn wood prices.

'Demand is growing, and so are the prices on the global markets. The wood industry is used to handling sizeable price fluctuations, but the situation at the moment is unusual. On the other hand, looking at the price trend for wood over a longer timeframe, growth has been quite modest. We may be heading for a situation where wood reaches a fairer market value,' says Christian Nielsen, market analyst for the industry organisations' Swedish Wood and the Swedish Forest Industries Federation.

Swedish sawmills have been able to keep production going during the pandemic. However, increasing demand for wood products globally has seen stocks at the Swedish sawmills run down. Production is continuing at full throttle and March became the best production month ever for the Swedish sawmill industry.

The global shortage of wood products is mainly due to lower production in other parts of the world. Several wood product manufacturers that usually have high output, temporarily scaled back their activity in 2020, leading to a major shortfall in the international market.

swedishwood.com



WDS COMPONENTS MOXON VICE HARDWARE KIT

Mitch Peacock used WDS's Moxon Vice Hardware Kit with Ball Handles to build his new twin-screw vice

The bench-top, double screw vice, often called a Moxon vice, after Joseph Moxon referred to one in his book *Mechanick Exercises*, has found popularity in recent years. With numerous ways to use them, especially for the unplugged woodworker, this should be of no surprise. In response, companies have produced hardware kits to build your own Moxon vice, of which WDS Components are one source. I've just built my vice, using a double ball handled kit they supplied, and also tried out their alternative handwheel.

What you get

- 1 The kit is comprehensive, with all the hardware needed to make a Moxon vice. All you need to add are the wooden jaws and optional leather linings. The hardware comprises:
 - ♦ Two M20 cast-iron double ball handles
 - ♦ Two M20 mild steel threaded rods (either 500mm or 1,000mm)
 - ♦ Four M20 surface hardened mild steel washers
 - ♦ Four M20 mild steel nuts.



The handles are of rustic design, and all external surfaces were free of sharp edges. The threads still held a little swarf from thread cutting, which cleared as the handles were run up the rods. Both handles had arms of slightly different lengths, measured from the centre of the threaded hole, although they appeared balanced when spun on the rods (essential for ease of use in the vice).

The rods, nuts and handles all have general-purpose screw threads, where I would prefer to see acme threads which are more suitable for vices in general. I do believe though that these M20 sets are plenty strong enough for this style of woodworking vice.

All the parts require a good clean, to avoid staining your hands and anything else they come into contact with. A light application of camellia oil should ensure ease of action.



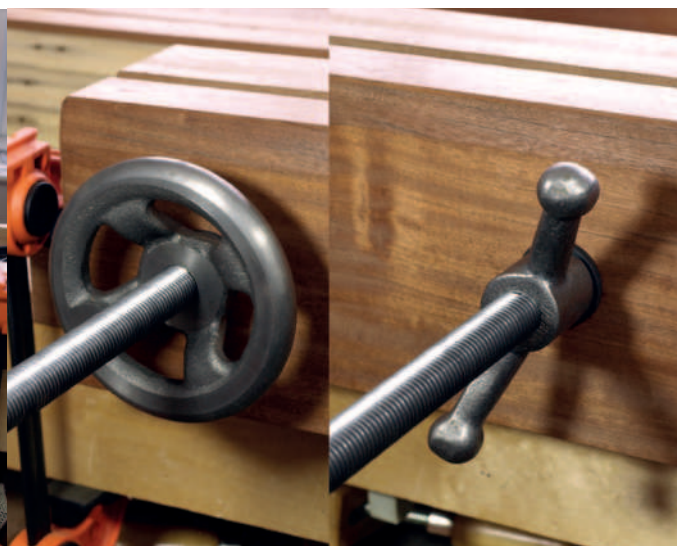
2



3



4



PHOTOGRAPHS BY MITCH PEACOCK

What you don't get

- 2 You'll need to add a couple of hefty boards to make a Moxon vice, and have access to a spanner for fitting the hardware (I used a 1-3/16in socket spanner). Facing the jaws with leather is a good idea to increase grip and provide protection to the material being clamped, so factor that in too. Other tools required are likely to be on hand in most workshops. There are no instructions, either supplied or available on the WDS Components website at the time of writing.

Building the vice

- 3 Don't be daunted by the thought of building a Moxon vice. With all the hardware supplied, you only need to saw two thick boards, one 100mm to 150mm longer than the other, bore through holes for the threaded rods (elongating those in the front jaw to allow raking), and chop two mortises to hold nuts in the rear jaw. Once that's done, you secure the rods through the rear jaw, pop the front jaw on and spin on the handles. Reducing the height of the rear jaw at its ends will ensure clamp heads don't interfere in the work area, while chamfers, round-overs, coves and quirks can dress it up a little.

Handles or handwheels?

- 4 In use, I found the double ball handles much easier to spin up the bars, making vice adjustment quicker, not to mention more attractive. The handwheel worked just fine though, easily applying sufficient clamping pressure.

Pricing

The WDS Components kits, with 500mm rods, are priced at £69.66 (inc. VAT) for double ball handles and £135.71 (inc. VAT) for handwheels. (Kits with longer, 1,000mm, rods are also available).

Conclusion

I'm very happy with the completed vice, which, despite my initial reservations over the general-purpose screw thread, operates quickly and smoothly.

If you wish to make a Moxon vice, a benchtop bench or indeed incorporate a double screw vice in your next workbench, it is worth considering one of WDS Components kits alongside the others on the market. If you struggle with rust in your workshop though, you would be better trying to find a kit with stainless steel screws.

THE ORCHARD BENCH

Michael Barrington's first woodworking project was featured in these pages in 2015. Now a new challenge awaits...





I spent quite a lot of time searching the internet for a book that would inspire me to make another garden bench. There I was thinking that most designs seemed to be quite prosaic when I came across a book by George Buchanan, which featured a stunning bench on the front cover. The book was aptly titled *Garden Furniture – A practical handbook for woodworkers* and was published in 1991. I bought the book straight away.

I thought that George Buchanan's bench would offer more of a challenge and learning opportunity than the previous two I'd made, both of which have appeared in this publication. Apart from the odd bit of DIY over the years, my woodworking experience was limited to these two benches, both of which I made during my retirement.

I would recommend George's book to anybody interested in making garden furniture, it's still available on Amazon. However, a note of caution. It states on the fly page that 'No special skills are required and only a basic familiarity with the tools is assumed'. I thought that suited me and my limited skills. I didn't take account of the fact that talented people often take their skill for granted! The book's author wrote that 'It is quite a simple seat to make'. Maybe for you George, but not so for me!

What follows is not intended to be a lesson in how to build this beautiful bench, you'll have to buy the book to do that, so I'll just pick up on what I believe are some of the key points I experienced during the build.

Joints

There are 96 mortise and tenons to cut so I make no apologies to traditionalists for using my American-made Mortice Pal jig, which I also used on my other two benches. This meant cutting two mortises for each joint with a router and making 'floating' tenons to fit from the same Iroko timber. A time-consuming and repetitive task but quicker than cutting traditional mortise and tenons.

Section by section

As you can see, the bench is made up of five separate sections and I decided to build one section at a time, starting with the backrests. I then added each section as I went along.

Angled backrest

The back legs that support the backrest are cut at an obtuse angle. The angle is achieved by sawing off the bottom part of the back legs at an angle, then gluing and dowelling the sawn-off piece to the reverse side of the leg, as shown in photos 5 and 6 on the following page. A plywood template was made for the rounded tops, which were cut on the bandsaw.

Arched backrest

This was the most challenging and enjoyable job of all. I needed a big space to work out the curvature of the three arches so I decided that my garage/workshop floor would come into play! Using a felt-tip pen I marked out the four central back legs on the concrete floor. Then, by trial and error I located the central axis point and drove a nail into the floor and tied a length of string to the nail. I then tied the felt pen onto the other end of the string and proceeded to mark the curve between the four legs. Happy with the result, I then placed plywood strips on the floor and drew the curves on the plywood which acted as templates when cutting the Iroko on the bandsaw.



1



2



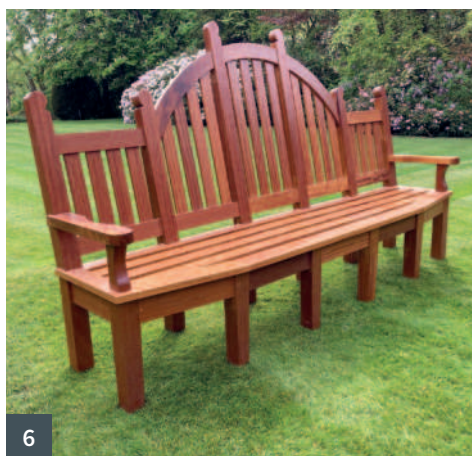
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6



7



8

PHOTOGRAPHS BY MICHAEL BARRINGTON

1 The bench design is published in *Garden Furniture* by George Buchanan **2 & 3** I built the bench in sections, starting with the backrests **4** The back legs were cut at an obtuse angle, then the sawn-off piece was glued and doweled to the reverse of the leg **5** Making the arched backrest was the biggest challenge **6 & 7** As you can see, the seating area is narrower at each end of the bench **8** I can now enjoy sitting in the garden as I prepare for my next challenge!

Seat slats

If you look closely at photo 7 you will see that the seating area is narrower at each end. This presented two challenges. First, a near 45° mortise joint in the end legs, and second, a tricky angled tongue & groove on the front slat at each end. Both tasks took time and patience to complete.

The book recommended screwing the slats from below, but the bench was so heavy to manoeuvre that I countersunk the screws from

the top and then used a filler.

Finally, rather than painting it white I decided that a natural finish was more to my taste. So, I used clear Blackfriars External Wood Stain to bring out the beautiful grain of the Iroko. I painted each section as I went along with four coats. It then took four of us to carry the bench out into the garden!

I'll keep you posted when I find my next challenge...

Power tools vs hand tools

Alan Goodsell contemplates the merits of different tools for different situations

Have you ever watched someone on a DIY show, or in real life, use a power tool when it looks like overkill for a simple task? The best example is the cordless drill/driver where it is used to power a screw into two pieces of wood to hold them together and the operator then wonders why the pieces are not held tight, not to mention the horrible chattering noise the bit makes when it tears out the head of the screw! This is when a proper screwing technique should be used. There should be a clearance hole drilled in the first piece of wood, so the screw doesn't blow out splinters of wood as it goes through, this is why it is virtually impossible to hold pieces tight when the screw is powered through two pieces using a power tool. Place the screw in the clearance hole and then it is an easy job to tighten the screw in the second piece of wood. Using a hand screwdriver, with a palm filling handle like a cabinetmaker's screwdriver, is often the best and quickest way of doing this. There is also little or no chance of tearing out the head of the screw as you can feel when it is tight and not relying on a poorly conceived ratchet setting on a power tool. This is just one example where a hand tool is better than a power tool; let us know of other examples that you know of or have experienced.



PHOTOGRAPH BY SHUTTERSTOCK

WORDSEARCH

Balustrade	Kerf	Sharp
Chisel	Maple	Spalting
Craftsman	Plane	Tenoner
Dowel	Pliers	Thicknesser
Joinery	Sandpaper	Woodturning

L	T	E	N	A	M	S	T	F	A	R	C	S	E
N	I	N	I	T	E	N	O	N	E	R	E	K	M
S	N	J	O	I	N	E	R	Y	G	T	I	L	N
R	R	P	P	L	I	E	R	S	E	Y	F	I	R
L	A	R	G	N	I	N	R	U	T	D	O	O	W
S	B	A	L	U	S	T	R	A	D	E	R	D	F
P	T	H	W	T	N	E	T	C	E	L	P	A	M
L	P	S	A	N	D	P	A	P	E	R	D	P	A
A	A	E	L	E	C	S	R	E	O	N	R	L	P
N	Y	I	U	D	H	G	N	I	T	L	A	P	S
E	R	P	T	H	I	C	K	N	E	S	S	E	R
D	O	W	E	L	S	R	E	K	N	S	E	R	A
S	S	S	D	C	E	F	R	E	K	N	E	A	S
L	M	Y	E	W	L	U	E	N	N	G	L	N	I

SUDOKU

Sudoku is a great activity to sharpen the mind. The object of Sudoku is to fill in the empty spaces of a 9x9 grid with numbers 1-9 in such a manner that every row, every column and every 3x3 box contains all numbers 1 through 9.

3		7			2			
				8			1	
1			6	5	3			
9		8	2			6		
		2	5	6	9	3		
		4			1	9		2
			3	1	8			5
	5			2				
			4			1		8



TOP 10 BANDSAW TIPS

Anthony Bailey gives you the best practice for getting to grips with your bandsaw

GO THE EXTRA MILE

1. Choose a good quality machine even though it will cost more, it will be a sound investment.

SHARPEN UP

2. Always work with sharp blades: bandsaw blades can go blunt quite quickly, the performance degrades and the resultant cuts are not very good.

BLADES AND BANDWHEELS

3. Setting up the blade carefully on the bandwheels and correct adjustment of the guides and thrust wheel is essential for accurate cuts.

SKIP IT

4. Except when cutting plywood or MDF use 'skip tooth' blades. These have a gap between each tooth, which gives vital waste clearance and a faster better, burn-free cut.

FOOLPROOF FENCING

5. On cheaper machines the straight fence doesn't work very well

as the blade usually has a 'lead'. That means the blade cuts slightly to one side, so to counter this, either mark a pencil line and follow it freehand or make a 'point fence'. This is a wooden bar with a rounded tip. Simply set at the correct distance from the blade, level with it and keep the work against the point. Then, simply push the wood through.

ON TENONS

6. All machines can do short tenon cuts. Clamp a stop to the fence behind the blade at the position you want and then make all the long tenon cuts. Then use the mitre fence to do the shoulder cuts. Again, you can clamp a stop to the table if needed.

KEEPING CLEAN

7. Bandwheels get covered in chippings very easily and the case in general can get very full of waste. It is important to have extraction and ensure the bandwheel cleaning brush is correctly positioned.

ZERO IN

8. Make sure the tilt table is correctly zeroed. You can check this with an engineer's square. There is always a means of adjusting it.



Skip tooth blades generally give a better cut



A point fence will help control the blade



Clamp a stop to the blade when making tenon cuts

WATCH YOUR FINGERS!

9. When making a cut, keep your fingers well away from the blade. When a blade completes a cut, it can spring forward suddenly, especially during a forced cut with a blunt blade.

TEETHING

10. CA 9.5mm width blade with a 6 or 8 tpi (teeth per inch) is a good all-rounder for most purposes, so this is the one to stock mostly, but keep one or two of the other widths handy for scroll cutting and deep cutting.



Regular cleaning of the bandwheel is important

AN ARTISANAL HALL TABLE – PART 1

A small console table gives Keith Smith the opportunity to practise making furniture joints by hand



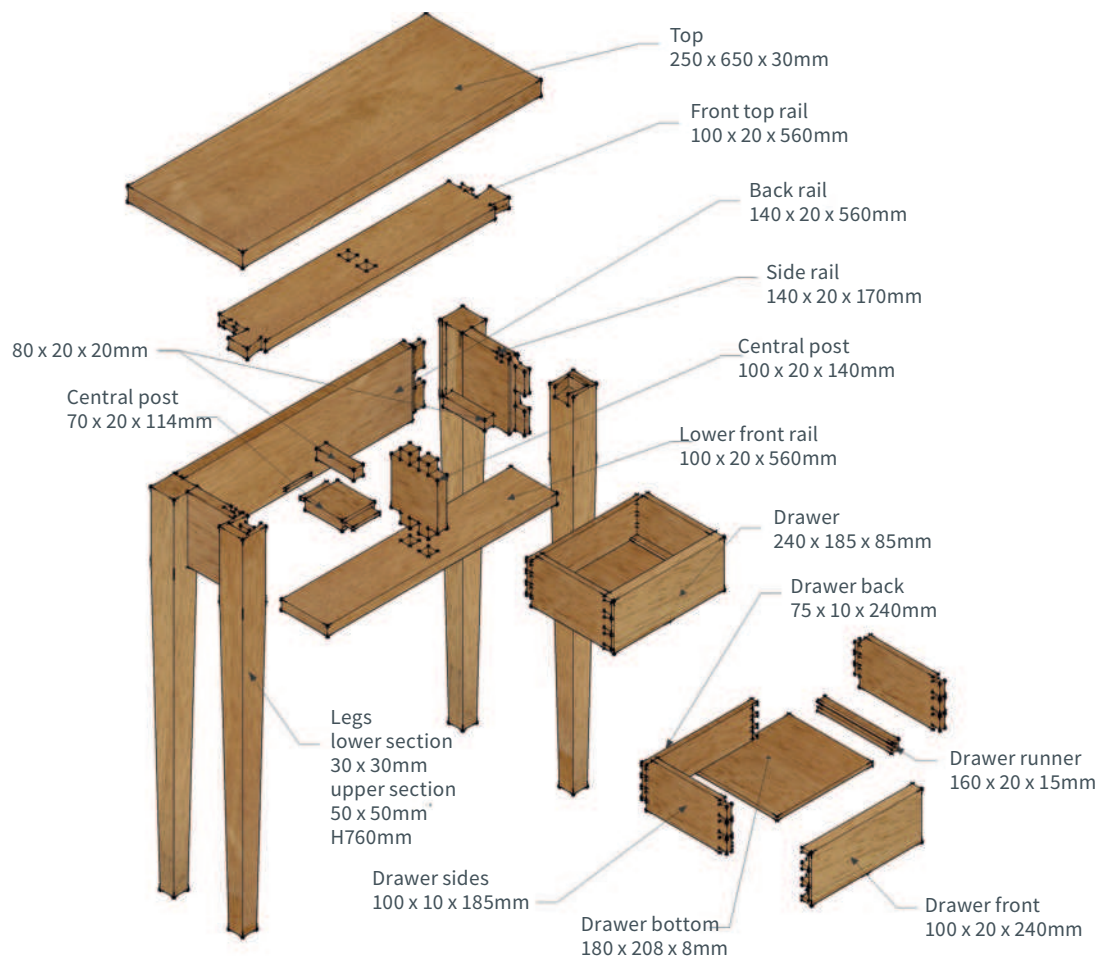
I don't get asked to make much furniture – it is impossible to compete on price with the likes of IKEA – so when I do get the chance to make something nice it is often more a labour of love rather than a profit-making exercise. This is such a job, a small hall table in oak which, apart from machining the stock to size, I planned to make by hand using traditional joints.

Design

This table is very much a traditional design with mortise and tenons and the top rail dovetailed into the leg and side rail. Once the piece is

finished most of the joints will be hidden from view and so it is an ideal piece for practising joint making.

The only slight variation I have made is to fit the back rail flush with the back edge of the legs. The hall it will be placed in is quite small and the table is to sit in a shallow space by the stairs, the maximum depth for the table overall is only 250mm leaving very little space for working drawers. Fitting the back rail flush with the back legs will gain me an extra 15mm; it's not a lot, but this will give me a drawer depth of 190mm, which will be enough to store keys and other small items.



1 The pieces for the construction of the framework were machined simultaneously in order to obtain consistent sizes **2** The taper was marked out on the legs in pen to make it easier to follow

The legs

The first job was to climb into the loft and choose the timber for the project. The legs are potentially the biggest problem from the point of view of the timber itself. To keep a more open design I did not want to fit stretcher rails and so the legs will be more susceptible to twisting. To minimise the risk, I had a good search round to find the straightest pieces I had in stock. They were all oversize and needed planing down to 50mm square. To keep any tension within the wood in equilibrium I took care to take equal amounts off each opposite face. Having decided to leave the top and the drawers until later,

it took about an hour to machine the main parts for the frame to size.

I used a ballpoint pen to mark out the taper on the legs; it makes a distinct line which is easier to follow than a pencil line when cutting freehand with the bandsaw. Normally I would not use a ballpoint to mark timber but the lines will be completely cut away in the process of tapering the legs. Next, with the bandsaw, I cut down (just outside the line) on two opposite faces, to within about 100mm of the finished cut length. This left the waste pieces still attached to the leg. Each leg was turned over and the two remaining tapers were cut completely



PHOTOGRAPHS BY KEITH SMITH/COURTESY OF LEGNO

3 & 4 The trick to successfully tapering the legs is to stop the first two cuts on opposite sides just before the scraps come off. In this way the lines remain usable and the piece can slide flat in the remaining two cuts **5** The marked lines had to be followed by eye. I used the widest bandsaw blades available to minimise the planing work required to finish the surfaces **6** To finish the tapered surfaces the non-tapered portion of the leg was held in the jaws of the vice and the plane ran along one side **7** I had to take care not to exceed the mark from which the square section begins where the joints will be made **8** A double tenon with shoulder was cut on each end of the side and rear crosspieces; this type of joint ensures the rigidity of the frame without weakening the section of the legs where the mortise is cut

through before removing the remainder of the waste.

This left tapered but rather rough legs, which I smoothed with a No.6 plane. It is vital not to plane the taper into the top section of the legs, which will be mortised. I drew thick pencil lines across the legs at the top of the taper and was careful not to plane the mark away.

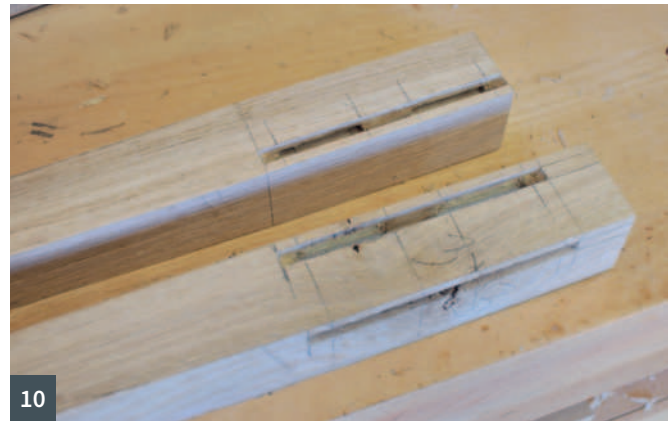
The next job was to cut the tenons in the side rails. In order not to weaken the legs too much I cut 8mm-wide haunched double mortise and tenons in the sides. The back rail has exactly the same joints and I marked and cut these out at the same time.

I sorted the two best legs for the front and marked them for

orientation. One of the remaining legs had a knot, and I set that so that the knot would be least visible. I then marked and cut the six mortises. I must admit I used a mortiser rather than cutting them by hand, and it took me about an hour to mark and cut them. I tested them for fit: they were a little too tight and needed some work before I could glue and clamp the two side frames together.

The table front

The front section consists of a top and lower rail joined by a central post; the post is joined to the two rails by twin mortise and tenons.



9 Before cutting the mortises, the pieces and their faces were marked in order to arrange the best visible ones **10** The mortises are positioned to bring the side crosspieces to the inner edge of the legs and the rear crossbar to the outer edge. The two cuts on the back legs (in the foreground in this photo) are therefore staggered; not limiting each other, it is not necessary to cut the tenons at an angle, as it must be done when the crossbars are centred with respect to the thickness of the legs **11** Gluing one of the side crosspieces to the legs **12–14** The central post connects the upper to the lower crosspiece and separates the drawer compartments. To prevent the double tenons made on the ends of the upright from slipping out of their housings over time, a diagonal cut was made on the heads that allows the wood to be spread with a wedge once the joint is closed

Rather than use a coping saw I chopped the central waste piece out with a chisel. I cut the mortises in the two rails and dry assembled the three pieces. These mortises do not have a lot of inherent strength, especially the lower one, and so I cut a slot across each tenon so that I could wedge them later.

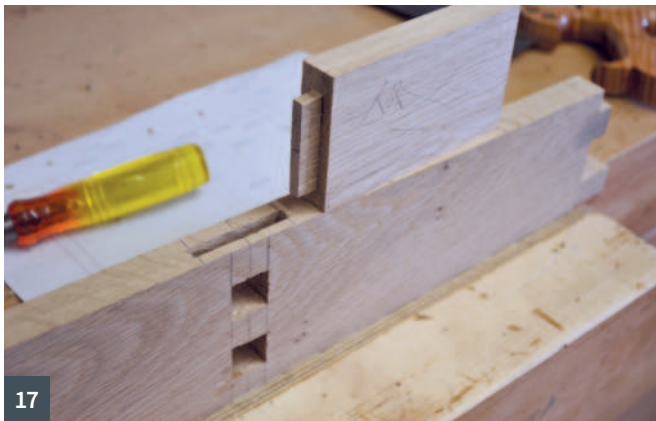
The next job was to cut the stub tenons in the lower rail, one goes into the leg and is 30mm long while the other goes into the side rail, which limits it to 12mm. The short tenon also had to be reduced to half its height and then corresponding mortises cut in the legs and side rails.

I then cut 6mm-wide 12mm-deep tenons in the central drawer

runner and corresponding mortises in the back rail and lower front rail.

Finally, the top rail is dovetailed into the front legs and side rails; as with the lower rail, the tail that goes into the leg is 30mm while the one that goes into the rail is 12mm. Once cut, the tails on the top rail could be used to directly mark out the side frames.

To check that everything fitted correctly before beginning the glue-up I dry-assembled the frame.



15 & 16 The connection of the lower crosspiece to the sides of the table is done with a double tenon. The shorter one also has a half thickness to allow the creation of a closed mortise in the lateral crosspiece **17** The lower cross member connects to the rear cross member via a small central cross member **18** The joints in this case include an 8mm tenon and mortise centred with respect to the thickness of the crosspiece **19** The connection of the upper crosspiece to the sides of the table is done with a double dovetail **20** Once the cuts were made in the crossbar, the tails were used to trace the head of the leg and the edge of the side crossbar

Assembly

There is a definite sequence of assembly with this piece. Firstly, I glued the back into a side frame and then applied glue to the lower rail joint and the central drawer runner before loosely fitting the lower rail and the runner. I put a clamp across the central runner and tapped the lower rail home; I then fitted the central post into the lower rail before fitting the remaining side frame (see photo 24). The top rail could then be fitted from above and the wedges driven into the tenons in the central post.

I used quite a few clamps to clamp all the joints tight, and then

used a piece of scrap MDF, which I had cut the same size as the drawer front, to check that the frame had gone together square; mine had not and I had to clamp it diagonally to pull it into square.

The top is made from a solid piece of oak, which I must admit I ran through the thicknesser rather than flattening it by hand. I then passed it through the drum sander and finally used the random orbit sander for final finishing, sanding it and the frame down to 400 grit.

In part 2, I'll add the drawers and finish the table.



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21 The first assembly was not only used to check the closure of the joints and the squaring of the pieces, but also to experiment the assembly sequence in view of the next gluing of the structure **22–24** The importance of this operation is in the glue setting times; the points in which to spread it are many and if you want to finish this phase, you need to work quickly. You need to know the sequence in which to add the pieces and have everything you need on hand **25** Adding the wedges can be done during the gluing of the structure or postponed to its completion. **26** The wedge enters the wood for a few millimetres, just enough to slightly expand the heads and prevent it from slipping out of the slots of the crossbar **27** It took several clamps to hold the joints tight

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BRACE YOURSELF FOR A BORING ARTICLE!



Creating holes ‘the slow way’ is very enjoyable, satisfying work and can help grow your skill set in other areas of woodworking as well, as Anne Briggs Bohnett explains

One of my first memories is using my grandfather’s eggbeater drill in his workshop. I used it to ‘build’ all kinds of treasures while he puttered around. Yet another reason I love hand tool woodworking is the ability to use them to empower young woodworkers. At three years old, my grandfather put a hammer in my hands and gave me an ample supply of wood and nails. I graduated quickly to a hand saw so I could better shape the wood to the necessary dimensions for my creations. Soon small squirrel and bird houses began to take form.

In many woodworkers’ minds, the speed, ease and accuracy of electric and battery-powered drills has erased the need for a good brace and hand drill from the workshop today. Even I grab my trusty Lithium-Ion drill far more often than I care to admit, but I’m still convinced even with the advances in technology, a good hand-powered brace and drill can never truly be replaced. For the same arguments as using most other hand tools, the brace and drill should more than earn their keep in every tool chest: less noise, less dust and less speed – read: greater accuracy, fewer burned tips and less opportunity for error.

1 To mount the bit in the chuck, flip the brace vertically and tighten the chuck



Mounting the bit

Boring holes is an absolutely essential woodworking task – whether it be as simple as pre-drilling for screws and nails, as complex as creating joinery or excavating waste from mortises.

HERE ARE MY TIPS FOR SUCCESS:

- ♦ Mount your bit properly
- ♦ Make sure you have a sharp bit and a well-oiled tool
- ♦ Use the reflection of a compact disc to drill straight
- ♦ If you're struggling drilling an especially thick hole, try drilling a pilot hole first with a smaller bit.

Mounting the bit in the chuck

Holding the brace horizontally, open the jaws so the bit can slide in. Tighten it just enough that the bit won't fall out, but is still loose, then turn the brace vertically and tighten the chuck around the shank of the bit; this will ensure that the bit gets mounted straight and will keep you from inserting the bit too far and damaging the inside spring mechanism of the chuck.

Mark the centre point of your hole with an awl. With a sharp bit mounted securely in your chuck and having taken on the proper stance, set the tip of your bit in the hole and start turning.

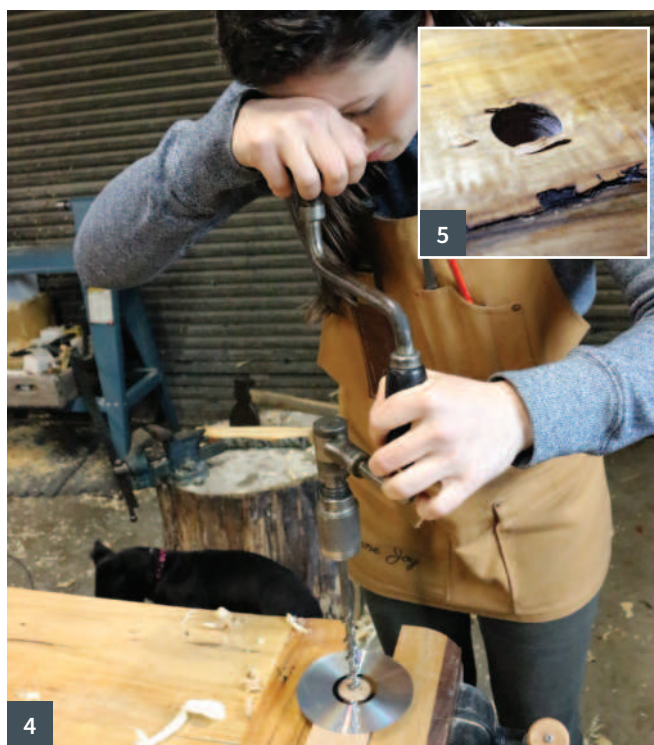
Drilling straight

As you drill, maintaining a straight, even line is crucial. Some people find it helpful to use two squares at 90° to one another for straight holes, or two bevel gauges set at opposing angles for angled cuts. This is easiest when drilling vertically, but can also be accomplished when drilling horizontally by clamping your squares/bevel gauges to the sides of your workpiece. A great tip I was recently taught is to use the reflection of a compact disc the same way you use the shiny plate of your saw to determine whether or not you are cutting straight. This works well both vertically and horizontally. To keep the disc where you want it when drilling horizontally, all you need is a bit of double-sided tape. Place the CD shiny side up with the hole centred over the spot you're about to drill. Watch the reflection of the drill as you advance the bit. If the image isn't an exact mirror, you're drilling crooked.

Both methods are great aids, but I recommend that you daily make a conscious effort to learn to 'see square' so the only apparatus you really need are your eyes to ensure you are always working straight and true. This will help with your sawing, will help eliminate layout mistakes and will allow you to foresee problems before they become bigger issues within your projects. Whenever mounting anything in my vice, I always take care to make sure it's sitting exactly at 90°, whether it 'matters' or not. Today, if my workpiece is mounted even 3mm crooked in my end vice, I can see the error from across the workshop.

Guarding against blowout

To eliminate blowout when drilling holes, especially large ones, come in from both sides of your workpiece with your drill, i.e. drill nearly through one side, then flip the board and complete your hole from the other side. A good tip here is to allow the very tip of the threads of your bit to poke out, flip and use that tiny hole as the centre for your bit on the other side. Another option is to tightly clamp a scrap board to the back of your workpiece and drill past your hole and into the scrap. Once the threads of your bit clear the opposite side of the board, the bit will not continue to cut as it's intended and the only way through at that point is excessive force, which is the cause of blowout at the back of the cut.



2 Mark the centre point 3 A CD is a great aid in drilling straight 4 Sight down the brace as you begin to turn, pause occasionally and check for square 5 Some ugly blowout

PHOTOGRAPHS BY ANNE BRIGGS BONNETT & JOHN BRIGGS

My boring tools

I store my bits in an auger bit roll made by Jason Thigpen of TX Heritage. The waxed canvas protects the bits from the moisture that constantly hangs in the air here in Seattle. The individual pockets prevent the bits from being jostled against one another and thus keeps the edges sharp. The pockets also help me to keep the bits organised by size so it's quick and easy to grab the one I want.

One of my most treasured tools is a Millers Falls No.2 eggbeater drill, which was expertly restored by Ted Hoeft of Lone Pine Toolworks. Ted has a passion for bringing tools back to life and the artful way in



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6 TX Heritage auger roll, made by Jason Thigpen **7** The beautifully restored eggbeater drill **8** My collection of boring tools **9 & 10** Sharpening an auger bit **11** Drilling benchdog holes is a great exercise

which he does so is absolutely incredible. I am certain that this drill, 100 years later, is nicer now than the day it left the factory.

No edged tool will work unless it is properly sharpened. A bit advances not by the pressure you put on it, but by the speed at which you turn the bit. If you are having to exert a lot of effort to advance the bit, it is likely to be dull and in need of a good sharpening. I have various files in my collection, including some of the finest Italian-made iridium auger files on the market. With just a few simple strokes in the right areas, all my auger bits are kept sharp and ready for service.

Practice makes perfect

Try building a traditional bench with offset pegs and plenty of benchdog holes. After drilling over 50 of these 20mm holes by hand through my 75mm-thick benchtop and 150mm-thick legs, my drilling had much improved and I had Popeye arms for a few weeks to boot! Experiment using a series of squares and reflective objects to find the most effective method for you to drill straight, concise holes. A few well-placed squares, mirrors or old CDs can help you build precision and muscle memory, and soon you will start to see and 'feel' square as you drill.

TURNED TABLE SKITTLES

Colwin Way makes a traditional game
to tempt the family away from their screens

The idea for this project came to me one evening when I was sat watching TV with my family and also browsing my emails on my phone. When I looked up, I saw that my wife and two sons were doing the same thing – we were all absorbed in TECH! All of us had our heads down with no conversation and I felt a little disappointed that we were wasting our precious family time uninterested in each other and looking into these little metal boxes.

I voiced my observations to my wife who immediately said yes, jumped up and grabbed a pack of cards, pulled over the coffee table and said: 'Right boys, tech down, let's play cards!'

After a little huffing and puffing we started playing and before long out came the board games. This started something of a little debate through the week as to what we would play at the weekend, which have now largely become tech-free zones!

I wanted to surprise them and come up with a game we could all play together that would be a little rowdier than a board game. This is quite a sizeable turning project, but great fun to make.

Table skittles is a great family game and in my area on the Devon/Dorset border of southwest England it is still played in the local pubs, being taken very seriously and divided into different leagues depending on the individuals' skill level.

I've scaled our table down slightly from the full-size pub tables you would see in your local, but it's just as much fun to play. The rules are fairly simple; just hit more pins down than your opponent! However, if you have a really competitive family there are more complex rules out there, just search online. As with all my projects I honestly believe anyone can make them even though initially some may seem a bit daunting. You may not have the tools or machinery I'm using, so I will suggest some alternatives along the way.

My table's made from offcuts of English oak for the main components, lignum vitae for the ball and 10mm MDF for the table base. We can divide the list of components up into seven pieces as listed in the drawings.

Safe turning

When turning glued sections, make sure you are protected in case the glue gives while turning. This is very rare but possible, for instance when using old glue, glue that's been subjected to very low temperature, oily or waxy timbers not adhering or simply poorly applied to surfaces. Be safe, wear a good-quality visor and don't turn glued sections at high speed. Don't stand directly in front of the project and always know your escape route.



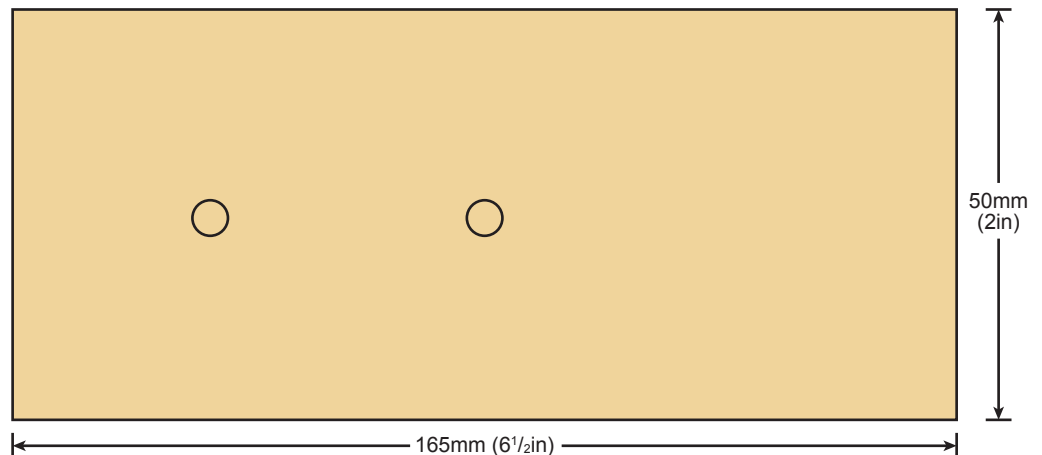
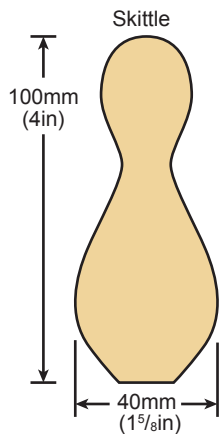
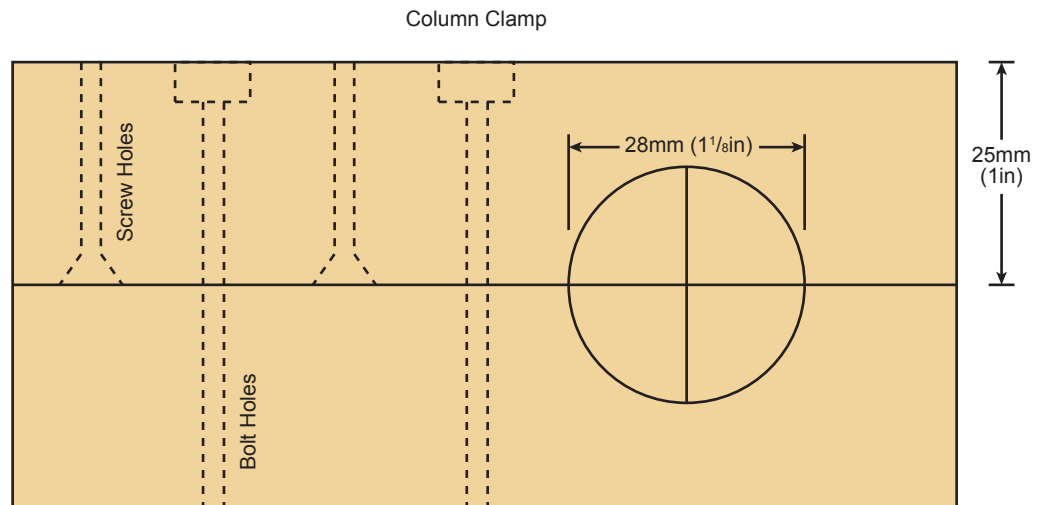
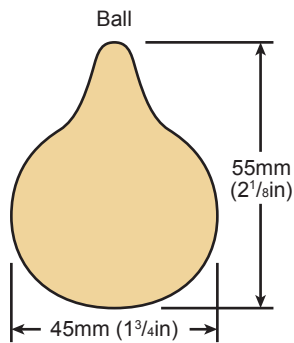
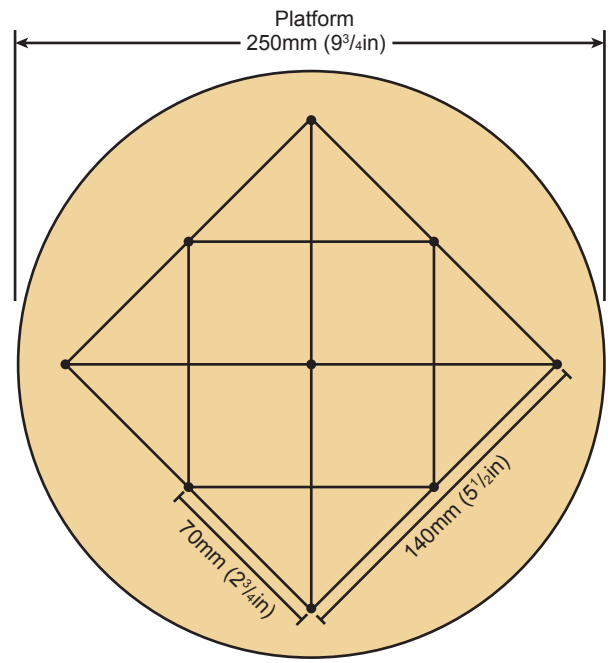
YOU WILL NEED

Tools:

- Router table
- Rebate cutter
- Decorative moulding cutter sash clamps
- PVA glue
- 6mm, 8mm, 28mm drill bits
- One pair of airline connectors
- Spindle roughing gouge
- Skew chisel
- Parting tool
- 10mm spindle gouge
- G clamps

Materials:

- Skirt
- Base
- Platform
- Nine skittles
- Two-piece column
- Two-piece column clamp
- Ball and chain





PHOTOGRAPHS BY COLUIN WAY

Making the rails and table base

- 1 My table base size is 615 x 405mm, so I machined my oak down with this in mind. First surface plane one face and one edge, and then thickness to clean and true the surfaces. I use a large planer/thicknessing machine, but if you don't have one you can use a hand plane, or you could buy your timber already prepared.
- 2 To make the skirt use a router fixed to a router table (I used a rebate cutter). Make several passes to create the rebate to take the 10mm MDF. Cut 10mm wide to give a good surface to screw the base onto. The second cutter is a decorative moulding to the top of your skirt rail. If you have no router, screw or glue a second piece of timber to the main skirt to create a rebate, meaning you can still screw the table base to the skirt. The top moulding could be simplified to a chamfer with a hand plane or just simply leave the top edge square.
- 3 Use a mitre saw to create corner mitres, but the saw can also be accurately set to give a tight joint. To make sure you get the correct lengths on the skirt rails, cut the mitre on one end of the rail, then hold them up to the base board and mark off with pencil before lining up to the saw. This can be tricky at first, but if you cut the rails a couple of millimetres bigger than you need you can still fit the board and your mitre will butt up nicely. If you don't have a mitre saw you could make your own mitre block and hand cut your mitres or don't do a mitre at all and butt joint your corners leaving the end

rails slightly longer, just protruding past the sides of your side rails.

- 4 Now the rails are ready, it's on to the base. Because we're going to be screwing into oak and you want the board to be pulled down tightly into the rails, drill a series of holes for the screws to pass through. These holes need to be countersunk for the screw head to sink below the surface of your MDF base. Space the screws approximately 60mm apart, giving a secure base and ensuring the base gets pulled up evenly to the rails. Drill the holes 5mm in from the edge of the board and use 25mm long screws with a 3mm pilot hole. I'm using a pillar drill, but if you don't have one, a cordless or hand drill will also work.

Making the platform

- 5 Now onto the platform. It's important that the skittles are elevated, so you have several options here. The obvious one is to keep the table square, but as I wanted to try something different, I've taken some oak and machined it into 40mm square lengths, then cut them into 250mm long pieces before gluing them together.
- 6 Once the glue dries, square one of the edges across the glued lengths before cutting across the lengths to, once again, create 40mm square lengths. Turn the end grain up and re-glue them back. To keep the pattern irregular, turn every other piece around so you don't have the same piece of grain next to each other.



- 7** Once the glue has had 24 hours to dry, mark your disc with a set of dividers or plywood template before cutting to shape. Clean up one side of your disc before you do this, either with a plain or electric belt sander as this face will be used to fix a faceplate to and eventually be the face to sit flat onto the baseboard. If you don't have a bandsaw, use a jigsaw or hand saw the corners to give an eight-sided piece to turn round.
- 8** Attach the disc to a faceplate and turn the edge until round before turning the toolrest to flatten the face of the disc. Use a large skew chisel flat as a scraper to flatten the face. Periodically check with a steel rule or straightedge to make sure you get the surface completely flat, or your skittles may not stand properly.
- 9** Once the platform is flat mark out the centre with a pencil, then using the diagram and measurements supplied mark out the skittle placings. Drill these points out with a 8mm drill bit, ready for the inlays to be placed in. I did no sanding until these pieces were added.
- 10** I'm using ebony to turn my inlays, but any contrasting timber will do

such as walnut. Hold the sections in a chuck, and with the help of a set of callipers and a parting tool, turn your inlays to 9mm then taper down to fit the 8mm hole. Once all nine are made, dab them with glue and tap into the drilled holes. Let the glue dry before putting back on the lathe and gently scrape down to the surface of the oak. Now you can sand the platform to a finish before sealing and waxing.

Making the skittles

- 11** The skittles are simple turnings, which I'm driving here with a ring centre friction drive. Leave waste wood to clean off, towards the top of the pin. Make sure you turn and slightly undercut the base of the skittle so they sit square on the table. Sand, seal and wax each skittle as you go, making nine in total. To ensure you get the skittles the same size start by measuring and marking each length with a set of dividers and each diameter with a set of callipers.
- 12** Remove the waste wood with a disc sander attached to the lathe before hand sanding, sealing and waxing.



Making the two-piece column

- 13** Now to make the business end of the table and the column the ball will swing from and mow your skittles over with. Making the arm in two pieces makes it easier to pack away after play, and saves having to buy expensive parts to join these together. You can use a couple of airline fittings. These are brass joiners and once glued in with epoxy will look perfect against the oak columns.
- 14** The columns themselves can be turned as elaborately as you want them, but I've kept mine fairly plain, opting to gently taper the upper section to a nearly pointed top, however, the bottom section needs to be parallel ready to be fixed into the column clamp.
- 15** When both the sections have been turned, seal and wax before gluing the brass joiners in. Push the brass joiners in enough to make sure that the columns butt up against each other tightly, instead of leaving a gap, then set aside to dry.
- 16** To make sure that the columns stand nice and straight, and without moving when playing, you need to make a clamping system of some sort. My clamps consist of two pieces of oak with a hole drilled through them both while clamped together

and a fraction smaller than the column itself. Here you can see the two pieces clamped and the start of the 28mm hole being drilled. Note the orientation of the pieces and the scrap wood in place so you can drill straight through.

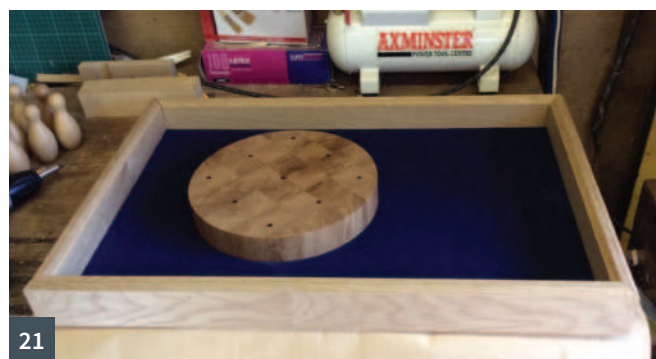
- 17** The large hole drilled, plus a second set of holes to take two bolts, which will be the clamping mechanism.
- 18** Now onto the ball, which I've made from a piece of lignum vitae. I chose this timber because of its weight, but if you don't have a piece then just use another piece of oak. Lignum is an extremely oily timber so I had to sand with wax to stop the timber clogging up the abrasive. I've already drilled a hole through the ball to thread the chain through, but alternatively you could screw in a brass eye and attach the chain this way.

Assembly

- 19** So, that's all the pieces made and it is time to start assembly. However, before you go too far, check the base and the skirt rails line up nicely before permanently fixing. Also drill four pilot holes with countersinks to fix the raised skittle platform with.



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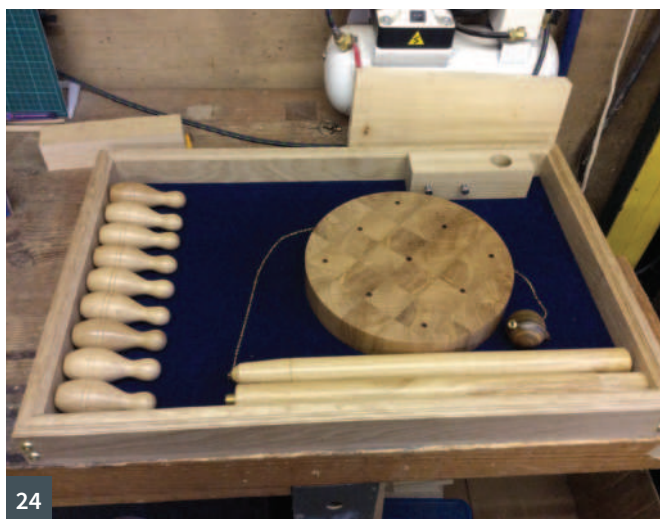
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- 20** Disassemble the base and choose your desired table covering. I ended up going for blue crushed velvet, but I was also torn between red and green. Peel off the backing and stick to the upper side of the table top, then trim the waste away with a knife or pair of scissors.
- 21** Now we can start adding the various components starting with the skirt and the raised skittle platform, which can now be screwed in position.
- 22** Here's a closer look at the column clamp. Drill and countersink one piece to be screwed to the skirt as well as two more holes which you can pass through two 5mm bolts. Glue the bolt

- heads in place with epoxy to stop them turning.
- 23** I tightened the nut with a spanner, however it would be much better to use wing nuts that can be hand tightened easily, as you don't want to be hunting for a spanner in the heat of a tournament!
- 24** I've made the table so it can be easily stored away and my intention in the future is to make a top cover for it also. Everything fits in the table neatly ready to be brought out on family game nights.
- 25** There we are, everything is in place and ready to play. As usual my family has been my inspiration for this project and I can already see the fun were going to have with this.

BACK TO NATURE

Tom Banks, known as Wooden Tom, spends his life carving and teaching carving from a remote cabin and workshop in the Scottish Cairngorms. He shares his story with *WWC*

PHOTOGRAPH BY RUPERT SHANKS





Many of us have dreamt of abandoning civilisation and living in the wild, fending for ourselves, building shelters, crafting our own belongings from the resources around us and escaping from the fierce pace of modern life, but few of us actually do it. Young carver Tom Banks has felt the call of the wild – and his workshops are opening up a back-to-nature way of life for others in the Scottish Highlands.

Tom learnt to carve from his granddad, who was a carpenter, when he was just a child, and even at a young age he loved to escape into the woods with his pocket knife and carve things by the fire. 'I absorbed a lot of useful skills from my grandad,' he says. Later he took courses with experts around the UK and worked as a woodland surveyor, which allowed him to wander the woodlands throughout Scotland. 'Perhaps most importantly I have made a lot of mistakes, and thankfully I have learned from a few of them,' he says.

His first ever project was a spork. Tom recalls: 'I was 13 and away with friends in Northumberland, building shelters and trying to survive off the land for a few days. This was our way of keeping off the streets and out of trouble. I forgot my utensils but had a pocket knife. I spent all day making this spork, and when I had finished, although it looked like a caveman had made it, it was functional. It was one of those moments which sparks an interest which has stuck with me all these years.'

Originally Tom wanted to set up a workshop where he could carve things and sell them, but he says: 'The folk of the Scottish Highlands are very hands-on people, and rather than buying they want to do it themselves, so I started teaching from the workshop.' His workshop is at Inshriach, around five miles south of Aviemore in the Cairngorms. 'All my workshops are in the woods without power or water,' he says. 'The current workshop has a frame made of roundwood pine with waste boards from the sawmill and recycled windows and doors. It cost £300 in total, and £200 of that was on the corrugated roof.'

He adds: 'I have a little cabin, but for me it is just a place to get out of the weather if it is bad. I prefer to work outside in the woods, simply on a chopping block with my axe. This is the beauty of working with hand tools – no dusty workshop, no noisy machines, good lighting and just the sound of the axe and wildlife in the background.'

As a greenwood worker he uses only hand tools. 'The tool I use for most of the work is the carving axe, an amazing tool. It is a sawmill, planer thicknesser and bandsaw all in one. It splits large logs into smaller workable chunks and then you can rough out the shape down to within a few millimetres of the finished dimensions. I also use a twca cam, which is a large Welsh bent knife used for hollowing cups and spoons.'

Homebody

Much of Tom's work is designed for the home. He says: 'I generally make functional things to be used in the home. Cups are one of my greatest passions. My design process normally starts with finding a cup which I like the look or features of, either in wood or often other materials, then I try to replicate it with green wood techniques. From there I will put it through tests of everyday use and make changes until I'm satisfied – although that rarely happens. I am constantly making little tweaks, so a design from one year ends up looking quite different the next year through a series of small changes which add up.'

His favourite wood to work with is birch, which he says has 'the perfect balance between being easy to carve but durable enough to last'. Although he has tried other materials, he sticks to wood now. 'I have tried my hand at metalwork but it is too messy for me,' he says. And he admits he avoids any jobs which require a lot of accurate measurements: 'I'm an awful carpenter!' In terms of finishes he prefers oil to varnish, 'as you can still feel the wood'.

Tom says: 'One of my favourite projects was a Japanese-style teapot. I loved the challenge of trying to figure out how to create this object, which is normally made from cast iron, out of wood.' His most challenging project was building his workshop – 'because I'm not one for measuring and straight lines', he says. He gets a lot of inspiration from the landscape around him: 'On my cups and goblets I paint mountain landscapes representing the Cairngorm mountains where I live,' he says.

Natural distance

Tom has been able to continue teaching some of his in-person workshops during the Covid-19 pandemic, but has tapped into a growing demand for traditional skills by offering a woodcarving subscription service that allows people to carve at home. 'I had to cancel a lot of courses,' he says, 'but the pandemic has not negatively affected my business yet. For the courses which I was still able to run I had to make quite a few changes. Thankfully I run all my courses outside anyway, which the advice would indicate is much safer than indoors. I had to make separate workstations, cordon off work areas and make sure everyone had all their own tools to prevent potential contamination via sharing.'

He adds: 'The carving subscriptions have been really popular. People choose a level depending on their skills. Every month I post out fresh wood cut to shape, for example of a cup. Together with the wood the person gets instructions and also step-by-step guides on YouTube for people to follow for each project. The projects are all designed to be completed with just two simple tools: a carving knife and a bent knife, which people can buy with their subscription.' Social media has been a crucial way for him to reach a wide audience.

Tom is currently working on micro-steam bending utensils, and plans to continue in much the same way going forward. 'I am not one for growing an empire and making lots of money,' he says. 'I love where I live and what I do right now, so I will simply carry on tweaking my pieces in the hope that one day I can be content with them.'

woodentom.com





'Perhaps most importantly I have made a lot of mistakes, and thankfully I have learned from a few of them'



PHOTOGRAPH BY ANNA DEACON

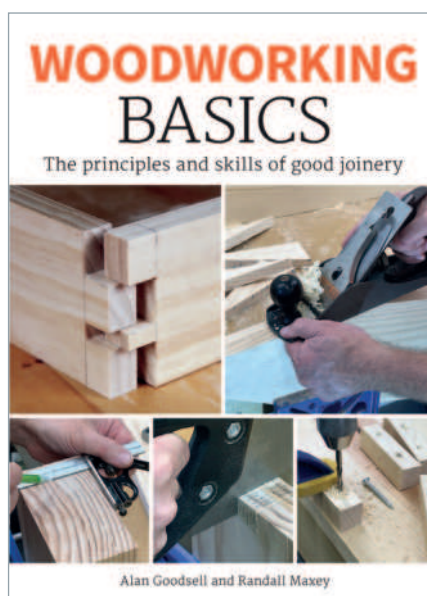
WALL CABINET

Alan Goodsell and Randall Maxey's cabinet design is just the right size for displaying collectibles, books or family mementoes

The unique, interlocking joinery that makes up this wall cabinet creates a strong assembly without fasteners. A little glue is all you need. The box joints add a lot of surface area for glue. They join the four corners of the cabinet assembly. The key to strong joinery is careful layout and cutting to ensure a tight, gap-free fit.

This cabinet doesn't have a back panel, though you could certainly add one if you wish. Instead, we added a pair of hanging rails on the inside that are used to secure the cabinet to the wall. The door frame is made with corner lap joints.

An acrylic plastic panel in the door provides visibility for the contents of the cabinet. The cabinet is made from common 25 x 150mm wood. The door frame is constructed from 25 x 50mm stock. The acrylic panel was purchased from a DIY store and cut to size after the door frame was made.



Woodworking Basics by Alan Goodsell & Randall Maxey, GMC Publications, RRP £14.99, available online and from all good bookshops

YOU WILL NEED

Cabinet sides:

2 @ 610 x 140 x 19mm

Cabinet top and bottom:

2 @ 405 x 38 x 19mm

Hanging rails:

2 @ 367 x 38 x 19mm

Shelves:

2 @ 361 x 140 x 19mm

Door frame stiles (sides):

2 @ 610 x 38 x 19mm

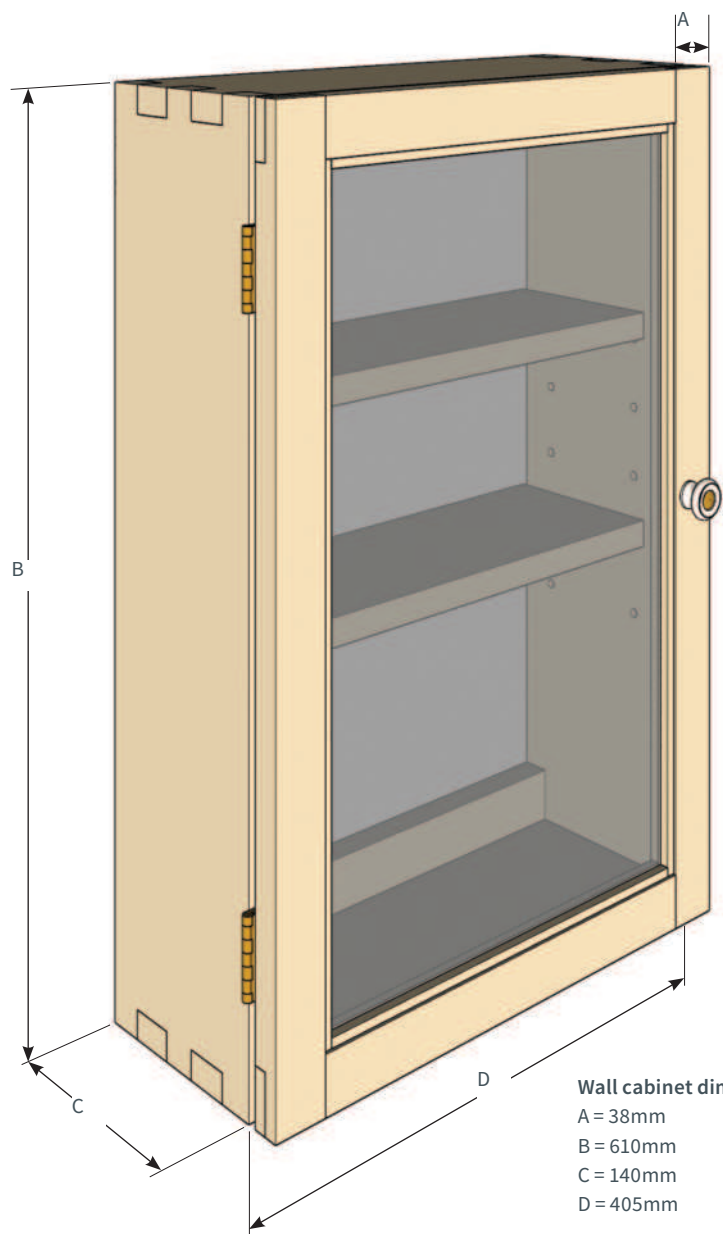
Door frame stiles (top and bottom):

2 @ 405 x 38 x 19mm

Glass stop:

3 @ 915 x 6 x 6mm

- 1 pair 50 x 25mm no-mortise butt hinges with screws
- 25mm cabinet knob
- 1 magnetic door catch
- 8 shelf pins
- Steel rule
- Marking gauge or combination square
- Knife
- Handsaw
- ¼in (6mm) self-centring drill bit (optional)
- Chisels
- Coping saw
- Hand plane or sandpaper
- Clamps
- Wood glue
- ½in (13mm) or ⅝in (16mm) wire brads
- Straightedge
- Awl
- Double-sided tape
- Wood finish



Wall cabinet dimensions

A = 38mm

B = 610mm

C = 140mm

D = 405mm

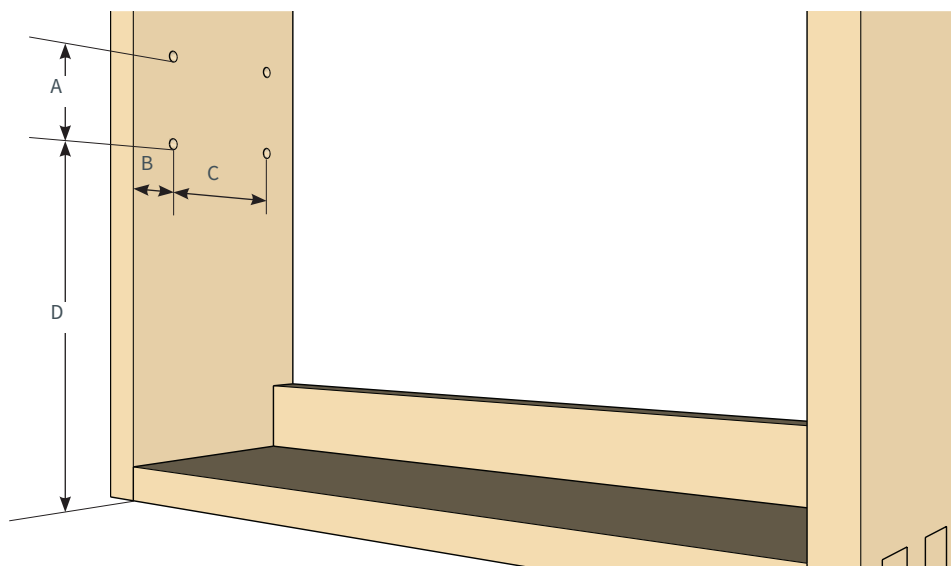
Shelf pin holes

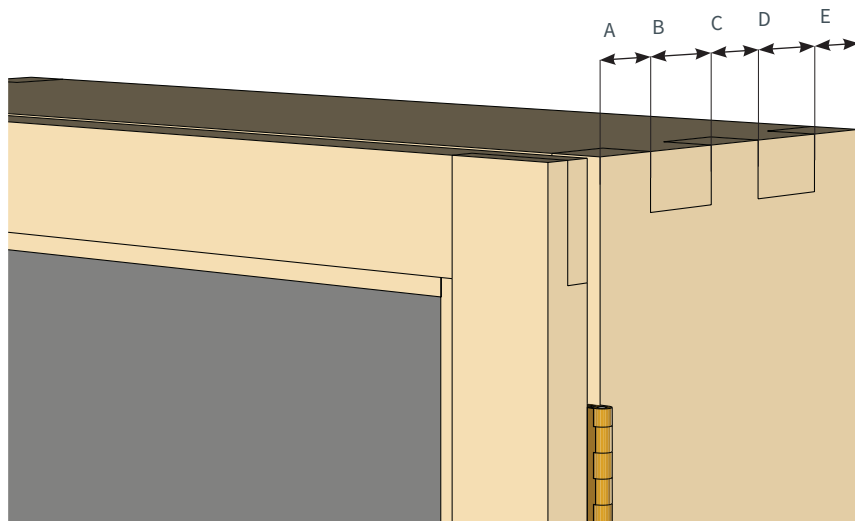
A = 50mm

B = 32mm

C = 85mm

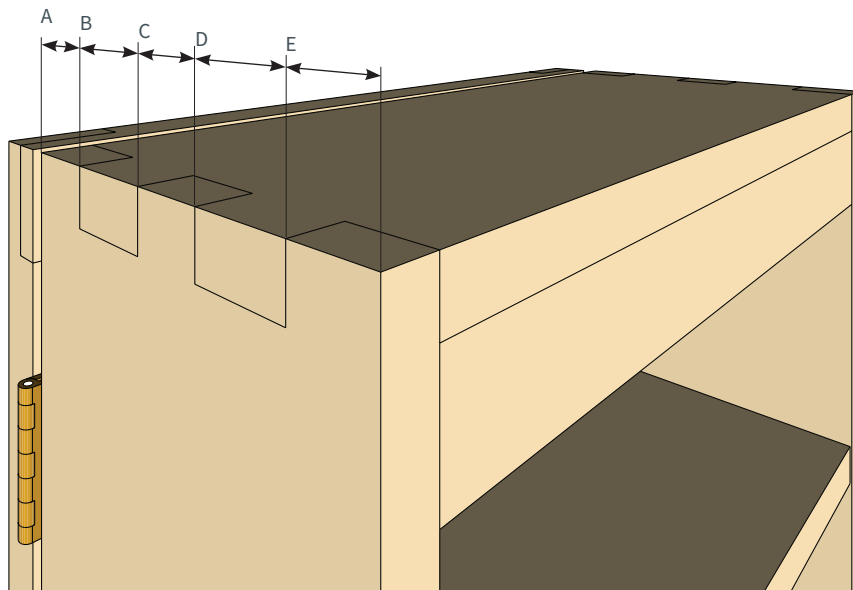
D = 200mm





Cabinet joint detail

A = 25mm
B = 32mm
C = 25mm
D = 32mm
E = 25mm



Cabinet joint detail (back)

A = 25mm
B = 32mm
C = 25mm
D = 32mm
E = 25mm

Making the cabinet box

The first order of business in making the cabinet is to cut the 25 x 150mm stock to final length. The top and bottom are 405mm long. The sides are 610mm long. It's important to make sure the ends of the boards are square while cutting them to length. Once the four parts are in hand, label them with the orientation for the best appearance facing out. It's also a good idea to number the joints at the corners for ease of assembly later.

If you want the shelves in the cabinet to be adjustable, you can go ahead and drill the holes for shelf pins in the cabinet sides. Just make sure you're drilling the face that will end up being on the inside of the cabinet. Shelf pins are available in a few styles and diameters with 6mm being the most common. Use the drill bit that matches the pin diameter and drill the holes 13mm deep.

Laying out the joinery for the box joints at the corners of the cabinet is best done using a steel rule, marking gauge, knife and square. We like to first mark the baseline, or bottom, of the joints on each piece using

the marking gauge. For this, we set the marking gauge slightly deeper than the thickness of the workpieces. This allows the pins of the box joints to sit a little proud after assembly. You can sand or plane them flush after the glue dries. Mark both faces and each edge at each end of the four parts.

Lay out the spacing for the pins and notches of the joint on each piece following the dimensions in the illustration. Carefully extend these lines around the end of the workpiece. If you have access to a combination square, this task becomes easier. Otherwise, you can carefully align your square to the previous mark and work your way around.

Now for the tricky part: be sure to properly mark the waste to be removed at each end of the four pieces. Use the illustrations and photos as your guide. The ends of the cabinet top and bottom should be identical. Likewise, the ends of the sides should be identical yet opposite the waste areas in the top and bottom. Careful marking and labelling will help you out here.



PHOTOGRAPHS BY GMC PUBLICATIONS

- 1 Lay out the box joints for the cabinet sides, top and bottom by stacking them together after cutting them to final length. Use a square to mark the edges of the pins and notches.
- 2 Use a knife to score the baseline for the box joints. Trace over the knife line with a sharp pencil to make the line easier to see when cutting. Mark the waste to be removed.
- 3 Stack two opposite cabinet sides together (top/bottom and sides) to make the vertical cuts. Keep the saw on the waste side of the lines and cut down to the baseline.

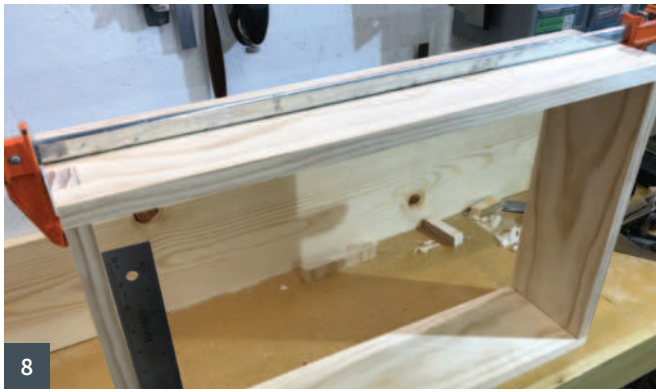
Cutting the joinery

You're now ready to make the cuts to create the joinery. Make the vertical cuts first, staying as close to the layout lines as possible without going over. We used a conventional saw for cutting the joint making sure that it had fine teeth for the task of joint cutting. Make each cut down to the baseline you marked earlier without cutting too deep.

There are two ways to remove the bulk of the waste between the pins. You can use a coping saw first then a chisel to pare away the remainder of the waste down to the layout lines. Or you can use a chisel alone, chopping down from the baseline. You'll need to work from both sides of the workpiece to get the cleanest cuts.

Once you have all the joinery cut, it's time to test-fit and trim each joint until you get a snug, but not too tight, fit. Work each joint individually and label it before moving onto the next joint. In the end, you should have a box assembly dry-fit with no gaps in the joints. Now is a good time to check that everything is square before you apply the glue. Then you can gently knock the joints apart with a soft-faced mallet, sand the parts, apply glue between the pins of the joints, and reassemble the parts. Measure across the diagonals to ensure the assembly is square before allowing the glue to dry. Apply clamps then move on to adding the hanging rails.

- 4 The cabinet top and bottom will need to have the waste cut away at the edges of the workpiece.
- 5 Use a coping saw or sharp chisel to remove the waste between the pins. If you use a chisel, work from both faces to avoid chipping and tearout on one face.
- 6 Begin test-fitting the joints and using a chisel to pare away material until the joint fits tight. Label and work the joints in pairs to make assembly easier later.
- 7 Make sure the notches are cleaned out down to the baseline of the joints to ensure the pieces sit tightly together.



- 8 Dry-fit the assembly, check that everything is square, and make any final adjustments to the fit of the joints. Apply glue and clamp together, making sure it remains square while the glue dries.
- 9 After the glue dries sand or hand plane the joints flush and soften all the sharp edges of the cabinet box using a plane or sandpaper.

Making the hanging rails and shelves

The hanging rails are simply 25 x 50mm stock cut to fit between the cabinet sides at the top and bottom. Apply glue along one long edge and clamp them in place flush with the back of the cabinet.

Use a hand plane to plane the pins flush with the cabinet sides. You can sand them flush if you don't have a hand plane. While you're at it, knock off the sharp edges and sand everything smooth.

Now you can make the shelves. The two shelves are made from the same 25 x 150mm stock used for the cabinet assembly. All you need to do is cut them to length and sand them smooth.

- 10 Cut the hanging rails to fit between the cabinet sides and glue them in place.
- 11 To drill the holes for shelf pins, use a tap 'flag' as a depth stop. Drill the holes 13mm deep.

Making the door

The door frame is constructed with lap joints at the corners. We oriented the joints so that the rails (top and bottom) of the door frame were behind the stiles. Again, a marking gauge comes in handy for laying out the joints. We first made a line that defines the width of the joint. You can use a square for this task. This width matches the width of the mating workpiece.

Next, you'll need to mark the depth of the joints. It takes a little trial and error to set the gauge to the exact midline of the thickness of the

frame. To do this, make a mark from each face of the frame stock. Then adjust the marking gauge until the two marks overlap at the same spot. Use this setting to mark the depth of the lap joint on the ends of all the pieces.

As before, it pays to label all the pieces and joints as well as mark the waste to be removed from each piece. To make the lines easier to see when sawing, trace over them with a sharp pencil.

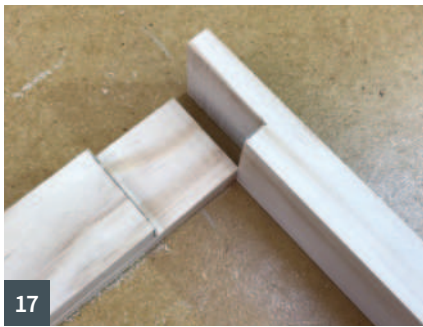
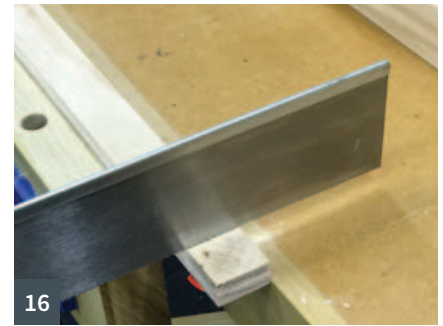
Use a rip saw to cut down the midline of the joint. Make sure to stay just on the waste side of the line. Use care at the end of the cut to make sure you don't saw beyond the layout line. Then you can use a crosscut saw to remove the waste. Clean up the joints with a wide chisel or sanding block using your layout lines as a guide, checking the fit often with the mating piece. The goal should be a flush, even fit with no gaps.

When gluing and clamping the door frame, make sure it's square by measuring across the diagonals. After the glue dries, sand everything smooth and knock off the sharp corners with a hand plane or piece of sandpaper.

To hold the acrylic plastic panel in place, we installed glass stop made from 6 x 6mm strips of wood we picked up at the DIY store. You can also find these at a hobby store. We installed the first set of strips on the inside of the opening flush with the inside of the door. Use small wire brads $\frac{1}{2}$ in (13mm) or $\frac{3}{8}$ in (16mm) long to hold the strips in place. This will also make it easier to remove them in case the panel ever needs to be replaced.

Next, cut the plastic panel about 3mm smaller in size than the opening in the door frame using a series of scoring cuts with a sharp knife. Take your time and use a straightedge to guide the cuts. It will take several cuts to score the plastic deep enough until you can snap it apart. You can file or sand the edges smooth if necessary.

Set the plastic panel in the door frame and cut strips to fit the inside of the frame. For these, we simply added a few small drops of glue and clamped the strips in place.



- 12** After cutting the parts for the door frame to length, stack them as they will be assembled with the edges flush and mark the widths on the adjacent parts. This determines the width of the lap joints.
- 13** Stack the four door-frame parts together with one end aligned to score the line with a knife and trace over it with a pencil. Carry this baseline around to the edges of each frame piece.
- 14** Use a marking gauge to score the centreline of the lap joint at the end of each frame part. Score a line along each edge down to the baseline. Mark the waste to be removed and verify your cut is on the proper face.
- 15** Use a saw to make the vertical cut down the centreline of the lap joint. Make sure to stay on the waste side of the line.

- 16** Make the 'cheek' cut along the baseline to remove the waste.
- 17** With the joint cut on two adjacent frame parts, you're ready to test the fit.
- 18** Check the fit of the lap joint and use a sanding block, hand plane or chisel to fine-tune the joint for a gap-free fit.
- 19** To easily create a rabbet in the frame opening for the acrylic plastic panel, tack 6 x 6mm strips of wood in the frame flush with the inside face of the door.
- 20** To cut the acrylic panel to size for the door, use a straightedge and make several scoring cuts.
- 21** If you've scored deeply enough, the panel should snap in two cleanly and easily at the cut line. If it doesn't do the trick, score the line deeper.



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Finishing details

All that's left to complete now is to add a few small finishing details, install the hardware and add the shelves.

When installing hinges, we like to fasten them to the cabinet first. Lay out the 75mm distance for each hinge from the top and bottom of the cabinet. Use an awl to mark the centre locations for the screw holes. Use a drill bit just smaller in diameter than the screw threads to pre-drill before installing the screws. A good option is to use a self-centring drill bit. The conical tip on the sleeve automatically centres the internal drill bit in the hole of the hinge.

A trick we use to properly locate the hinges on the door frame is to apply double-sided tape to the loose hinge leaf in the closed position. Then you can set the door in place, ensuring it's centred on the cabinet. Press down on the door frame at the hinges to temporarily attach the hinge leaf to the door. Carefully open the door to mark the screw hole locations as before. Then you can remove the door frame, remove the tape, drill the pilot holes for the screws and install the screws to fasten the door to the cabinet.

Adding the door knob involves nothing more than drilling a hole and installing the knob with the included screw. Install the magnetic catch at the top or bottom of the cabinet on the inside. Install the magnet base with the magnet flush with the front cabinet edge. Snap the metal door plate onto the magnet with the nibs pointed towards the door. Close the door and press the door frame into the metal plate so the nibs will mark the proper location on the door. Then install the plate on the door with the included flathead screw.

Apply the finish of your choice and hang the cabinet on the wall. It's best to secure the cabinet to a wall stud with screws through the hanging rails.

- 22** After marking and drilling the pilot hole for the hinge screw, install one hinge leaf to the cabinet.
- 23** Use double-sided tape on the hinge leaf that will be attached to the door. Align the door on the cabinet and press down firmly until the tape grabs.



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- 24** Carefully open the door and drill the pilot holes. This is a self-centring drill bit to automatically centre them.
- 25** Install the cabinet knob of your choice by drilling a mounting hole in the door frame.
- 26** Fit a magnetic catch to keep the door closed. The magnetic base fastens to the inside top or bottom of the cabinet, flush with the front edge.
- 27** To install the metal plate for the magnetic catch, first place the plate on the magnet with the nibs facing outwards. Press the door frame into the plate to mark its location, then fasten it with the screw.
- 28** The finished cabinet, ready for display.

JOINED-UP THINKING

– putting joints into practice

John Bullar's simple table shows how he applies his knowledge of joints

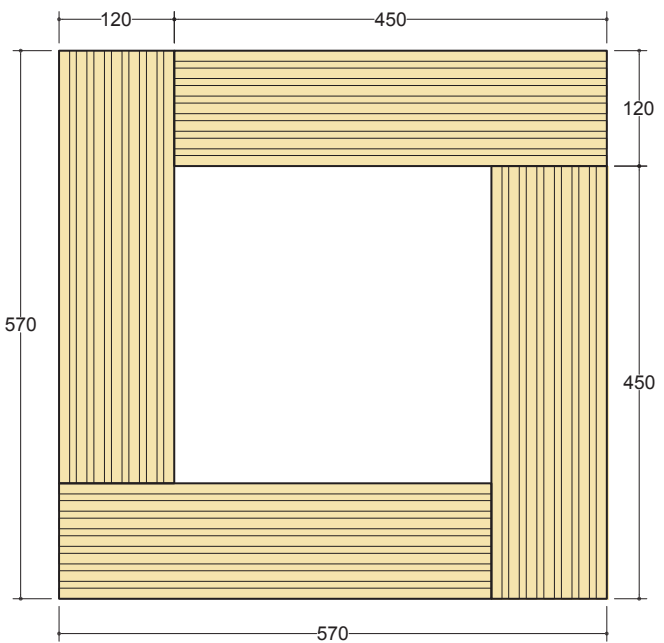
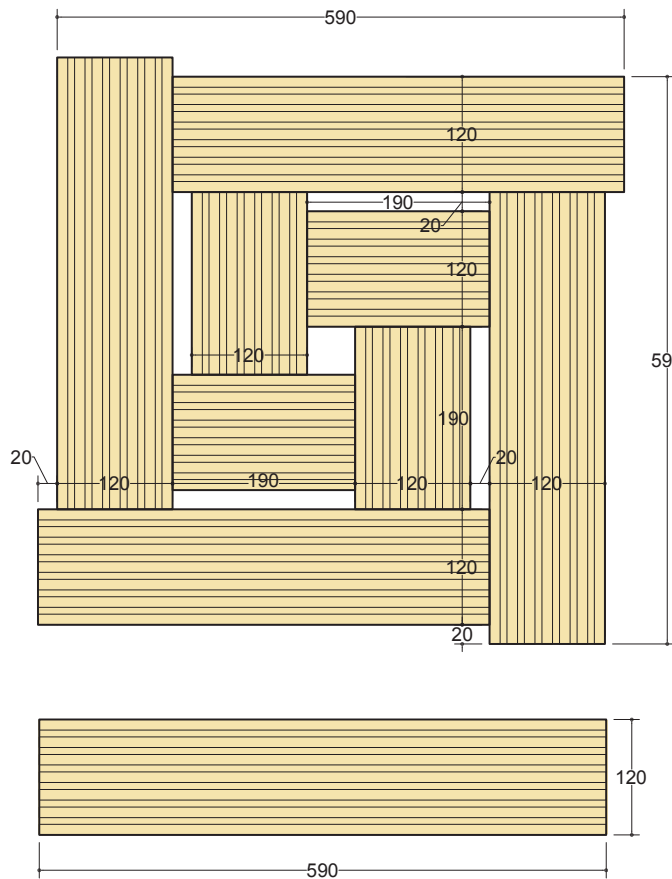


This article describes an exercise in the practical application of joints. I will look at how two straightforward joints, both cut with power tools, can be used to make a down-to-earth piece of furniture – a small table for the garden or conservatory.

We all have different workshops and different tools we like to use, so I will try to cover a number of options at each stage. The construction is more straightforward than it looks. The corner

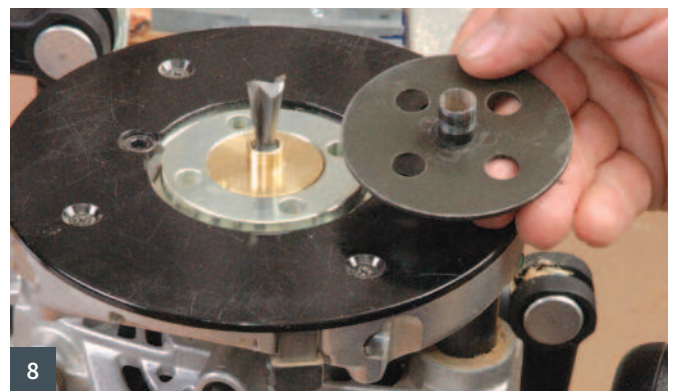
joints for the legs are half-blind dovetails cut with a router jig. Butt end joints hold the top together and for these you can use biscuits, Dominos or dowels.

The wood is just three ready-prepared boards, so there is no planing to be done and practically zero waste – I used treated decking planks to match a platform in the garden. Although the legs are thin they are in pairs at right angles, so the finished table is sturdy.



Cutting to length

- 1 Start by laying out your boards on a flat benchtop to mark off the lengths. Also, check they are straight and not bowed, cupped or twisted. Ideally this will have been done before leaving the suppliers, but it is worth checking again in case they have moved with drying. The overall length of each board I used was 2.4m.
- 2 Having marked the length, draw a pencil line with a square across one face and one edge of each board, then cut along it with a sharp panel saw. Alternatively, use a slide mitre saw or a saw bench. A hand-held circular saw could be used with a crosscut guide, but not a jigsaw because it will not produce cuts that are straight and level enough.



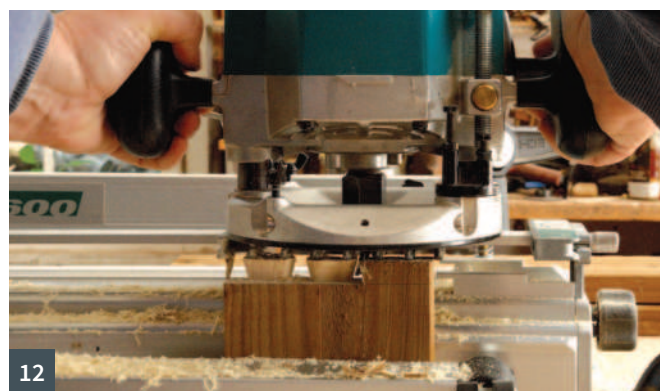
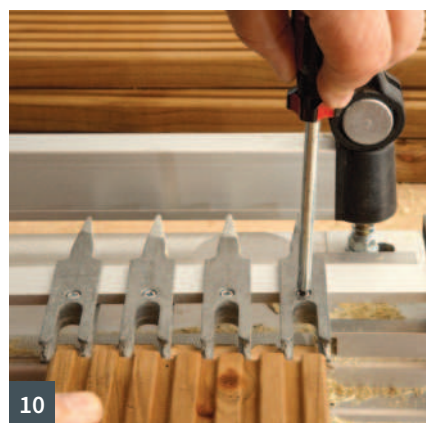
Checking the layout

- 3 I don't like to rely on measurements alone because I find it too easy to misread numbers on the measure, or mix them up in my head. For that reason I always apply a 'sanity check' and lay pieces of wood together as each one is cut. Any discrepancies between them should then be obvious, and I can stop and sort things out before too much damage is done.
- 4 Once you are satisfied with the lengths, lay out all the boards in neat piles to make sure they match and you have the right numbers of each. There should be four legs, four outer and four inner table top boards and four lower shelf boards.
- 5 The table top is made from two matching rotating patterns, one outside the other. There is a small gap between the patterns and a hole in the table centre, which could take an umbrella, but the exact dimensions are not important, so long as all the parts fit tightly together.
- 6 As well as providing a surface, the lower shelf braces the legs and stops the table from buckling. You could make the lower shelf match the top but on the table I made, it consists of only the outer

rotating pattern of horizontal boards. The length of the lower boards is slightly shorter than the top ones by one leg's thickness. This is because the lower ones butt up against the inside face of the legs, whereas the top boards form a joint that passes through the thickness of the leg.

Prepare the router joints

- 7 When you are choosing the ends to make the router joints, avoid the knots, especially large ones or loose ones. Softwood, like the cheap fir sold for garden work, tends to have a lot of knots, and these won't cut cleanly with a router and won't glue well.
- 8 The joints that connect the legs to the table top corners are cut with a router. The router itself needs precision guidance for this job so it is fitted with a guide collar on its base, through which the cutter protrudes. Collars come in various shapes and fittings but the size must match the jig it is used with. The router cutter itself is tapered so it makes a slot that is deeper at the bottom and this will form the socket between dovetail joints. Adjusting the cutter depth needs a lot of care so it cannot foul on the collar.



- 9** The router jig has a set of metal fingers like a large comb. This is designed to guide the router cutter as it passes in and out of the wood, forming a series of sockets between dovetails.
- 10** On some dovetail jigs, such as the one I am using here, the fingers are adjustable in position, allowing you to vary the spacing between dovetails. This feature is nice to have – I used it to line up the spacing of the joint with the pattern on top of the wooden boards. However, this is by no means essential and a fixed comb router jig can make good, sturdy dovetail joints.

Cutting the router joints

- 11** Different router jigs work in slightly different ways. Some will cut both halves of the joint at once while others, like the one shown, do one half at a time. Here, the wood which will form the edge of the table top is clamped horizontally with its face side down, while the half-blind (closed ended) sockets are routed in its underside.

- 12** The wood that will form the legs is clamped with its outer face turned inwards for the second stage while cutting the dovetails themselves. This time the wood is clamped vertically and the template turned over as described in the router jig manual. There is no change to the depth setting of the router cutter, so both sides of the joint will match in depth.
- 13** I have got myself into the habit of test fitting each joint as I make it. That way if there was a mistake in the set-up, I would hopefully spot it early and minimise the wasted time and materials.

Lining up the top

- 14** Each of the boards forming the outer pattern of the table top will be butt-jointed against the edge of the next board. The butt joint is positioned so that with the dovetail fitted, the outer edge of the butt joint will just align with the inner face of the leg.



15 The corresponding sides of each butt joint are numbered to record which will fit which. Pairs of alignment marks are drawn across both sides of each joint, ready to use with a power jointing tool.

16 Perhaps the most familiar power jointing tool is the biscuit jointer. With careful use, its joints are sturdy and reliable. The best biscuit jointers are expensive but there are a lot of moderately priced ones too. An alternative is the Domino jointer, which makes mortises for use with its own longer, thicker type of biscuit. Admittedly, they are stronger than biscuits but these machines are always on the expensive side. The third option here is to use a line of dowels. You can bore the holes with a dowelling jointer, or a dowelling jig. Alternatively, you can just use cheap, simple centre markers known as 'dowel points', followed by careful drilling.

17 When you use a power jointing tool, the wood needs to be firmly clamped to a secure bench. This allows you to press the tool tightly against it so it cannot slip or vibrate while the socket is being cut.

Assembling the table

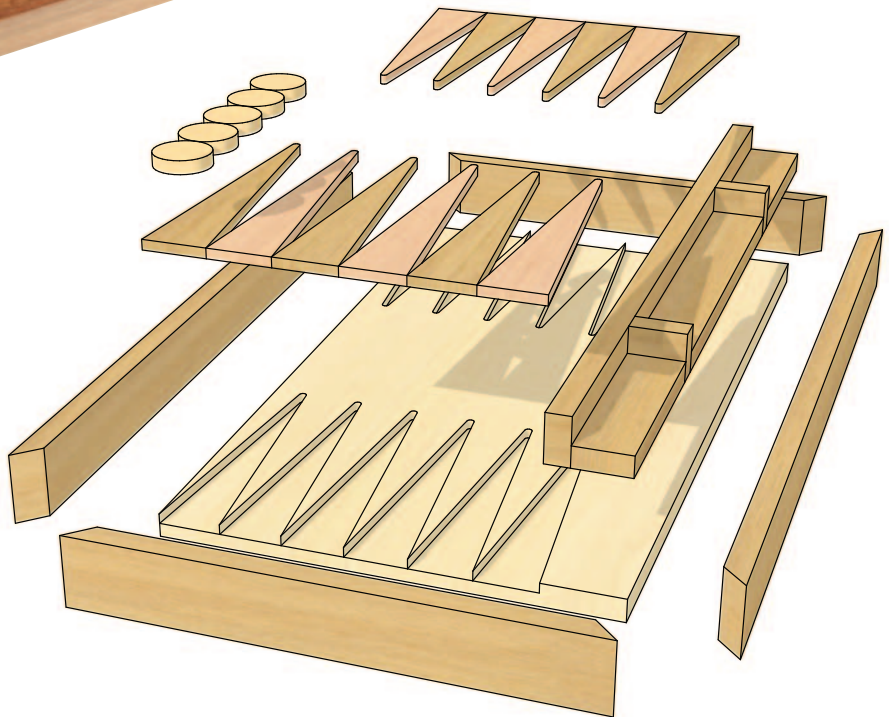
18 The butt joints are assembled and glued-up, starting from the inside of the table top and working outwards. Use the best quality waterproof PVA, and don't forget to line each joint socket fully with glue. Also, apply glue evenly across the end grain before closing the joint. Old woodworking books often tell you that gluing end grain forms weak joints but with the best modern glues this is not true.

19 It is important that all the joints are clamped firmly together while the glue sets. Exactly how you arrange this depends on how many clamps you can lay your hands on and what type they are. If necessary, you can glue the table top up in small stages with just one or two clamp.

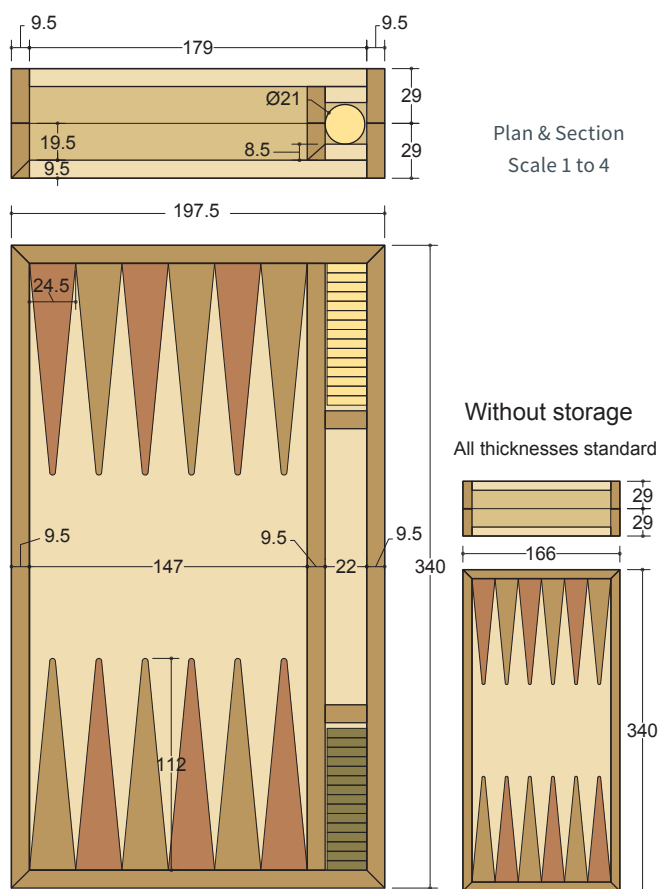
20 The constructed table is complete and ready to use. Although the wood is pre-treated, it will benefit from a couple of coats of wood-preservative stain.

BACKGAMMON BOARD

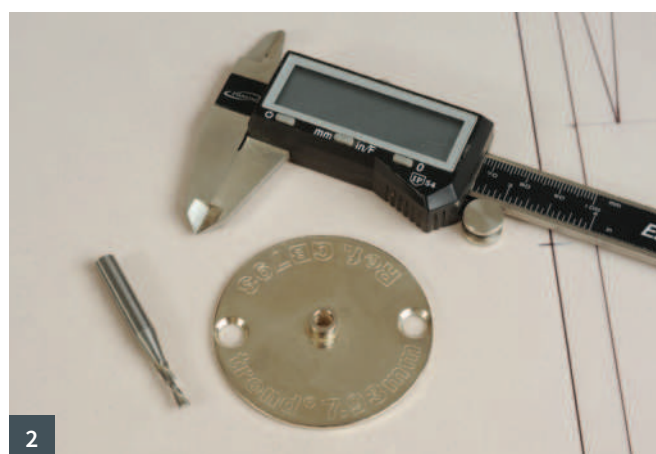
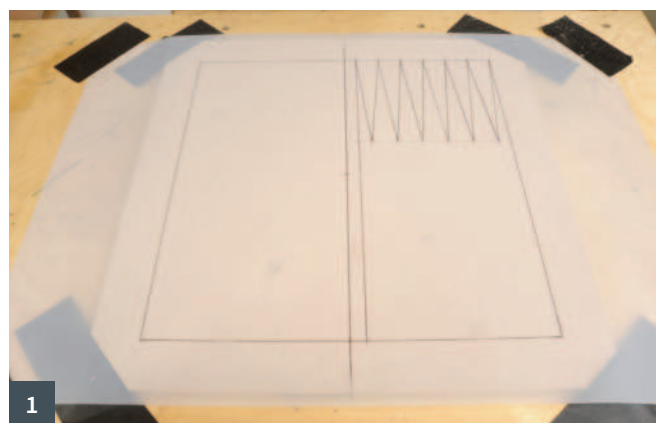
Anthony Bailey takes on the challenge
of making his own game board



The game of backgammon is one of the oldest board games and requires luck and skill to win. Each player has 15 checkers and there are two standard dice plus a special numbered dice thrown from a cup. I thought making a backgammon board would be a challenging and interesting project. The case hinges and catches can be bought online, as can the dice that are required to play the game. You can also find a lot of information about game play and strategies for backgammon on the web.

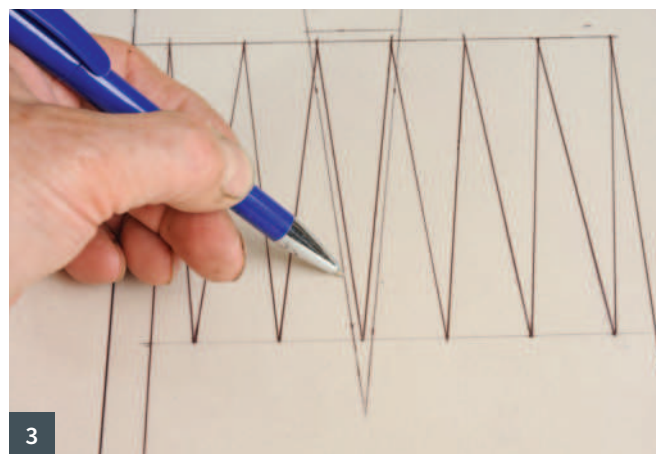


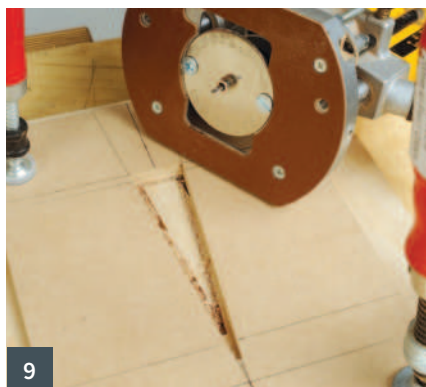
Plan & Section
Scale 1 to 4



Making the boards

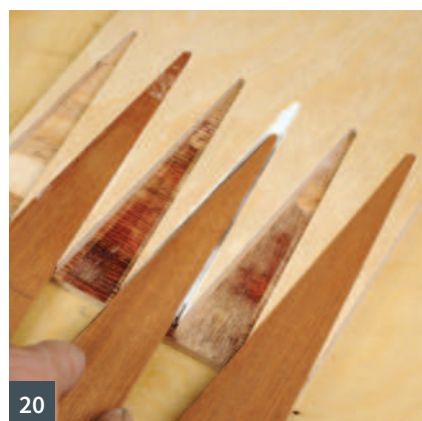
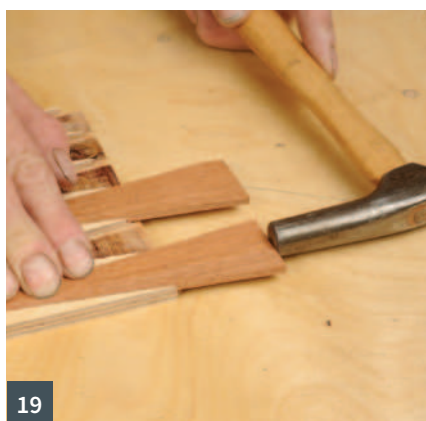
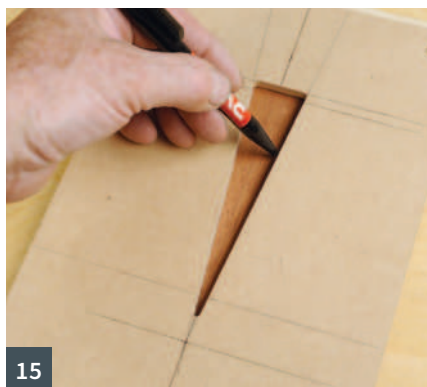
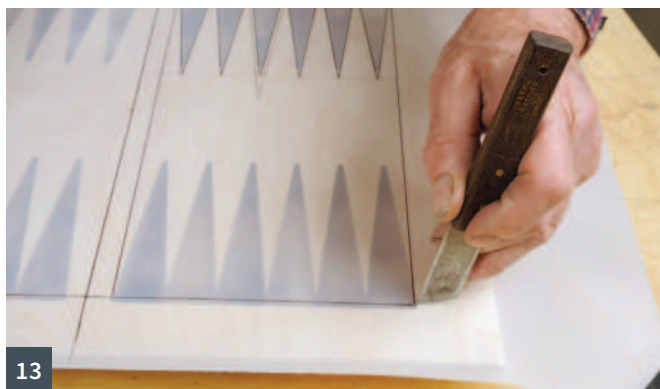
- 1 Start by copying the dimensioned drawing onto matt drafting film and tape it down, centred on a birch ply baseboard blank 400mm square. You only need one quarter of the pattern drawn out.
- 2 I used the Trend inlay kit because the spiral cutter is just $\frac{1}{8}$ in diameter and comes with an equally small 7.93mm guide bush. The triangle shapes were too slender to use the kit as Trend intended, so instead of machining both the recesses and infill pieces to fit, these would have to be shaped by hand.
- 3 The guide bush allowance is approximate due to the diameters of the cutter and guide bush. Drawing it out on the drafting film with an 'overrun' at the outer edge allows you to design the template required.
- 4 A sharp knife is used to 'prick' out all the key positions on the birch ply baseboard. This allows accurate positioning of the routing template. To do all four ends, turn the drawing around 180° and mark, flip it over and mark again, then turn it around 180° . Align it each time using the corner 'prick marks'.





- 5** Draw the triangle shape, including the guide bush allowance, on 6mm MDF. The fence is a piece of waste ply stuck down with Trend's special double-sided jig tape, which is extra sticky. It is positioned by lining up the static cutter against the pencil line at both ends, then positioning the fence against the router base and pressing down firmly to fix it.
- 6** To machine the overrun end of the triangle, the fence batten is similarly placed. As the router could cut into the template, although it is not critical, I used a carefully positioned finger to pull the router base firmly against the fence.
- 7** Having 'pricked out' the key board positions, the shape of each half of the board plus the centre waste allowance is carefully marked out with a fine-edged pencil.
- 8** The template is placed over the first triangle position – note the two small knife marks being used to set it accurately. A template fence of ply is stuck in position with double-sided tape once the template is aligned both for perpendicularity and projecting over

- the board correctly, then screwed on to the template ready for creating all the recesses.
- 9** The first recess is machined in outline; some ply will need to be removed at the narrow tip as well. The cut depth is fractionally less than the inlay thickness to allow for flush sanding later.
- 10** The bulk of the recess is taken out using a larger-diameter straight cutter and guide bush set at or fractionally above the depth of the outline cutter. Note that the guide bush offset should not bring the cutter closer to the template edge than the outline cutter or the recess shape will get damaged.
- 11** Machining the last recess, note that two clamps are used each time, thus avoiding the template moving under machining stress. The slight height variations in each recess are not important at this stage.
- 12** The whole surface is sanded evenly. Work from side to side to avoid catching on the pointed shapes. Once the surface is clean and smooth it should be sprayed with clear lacquer to keep it clean and light in colour during subsequent operations.



- 13** Reattach the drawing and mark the corners ready for cutting the boards apart. This must be done accurately; a tablesaw is best, but alternatively it could be cut and planed by hand.
- 14** Here are the machined boards ready for their infill pieces. The points do not reach the ends because they are slightly over-length to allow for final trimming.
- 15** The template can be used as a crude method of drawing out the infill pieces on your chosen hardwoods. A slender-tip ball or rollerball is needed to get into the edges. Twelve pieces of each of the two coloured woods will be required for this.
- 16** Cut them out roughly on the bandsaw, ensuring you have drawn the grain running parallel with the shape – not at an angle, as it may look odd and complicate trimming them due to grain angles.
- 17** The next operation is interesting; using a technique that I find useful for small sections, each triangle is pushed over an inverted sharp hand plane, which is resting in the vice but not clamped, to avoid damaging it. It works well and very quickly, but keep

your fingers clear of the blade and, just like an electric planer, most of the blade must be covered. Here I am using two layers of gaffer tape for safety.

- 18** Each piece is offered up to its own slot in turn, taking care to keep the correct alternating colour order. Trim each one on the plane until they line up – the point will overhang the recess end, so you need to 'sight' the fit. A sharp chisel is used to trim and round the ends. Try fitting again and trim as necessary until a tight all-round fit is achieved.
- 19** Alternate infills of the same colour and species are dry-fitted. A few light hammer taps will help bed the infills into place and ensure they look neat. They are plenty over-length to allow for re-trimming if needed.
- 20** Now the first set of alternate infills is glued in place. Start by applying glue to all meeting edges, then slide the infill towards the point, making sure it is bedded down well on the board.

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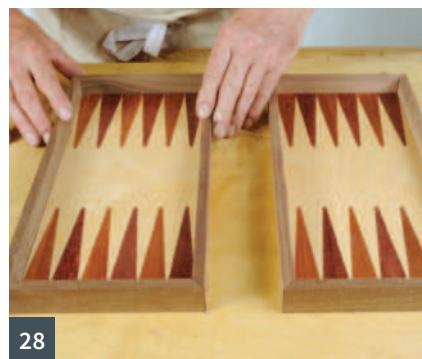
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- 21** Once the glue has dried, invert the board and trim off the excess from the infills. Now repeat the whole infill sequence with the other wood, filling in the gaps in between. You need to have done the previous set first so that the overhanging infills don't get jammed against each other.
- 22** Both boards are placed together against a batten placed shallow in the vice, acting as a stop. The boards are carefully and evenly belt-sanded level with 120 grit before using a random orbital sander and 240 grit to give a nice scratch-free finish. A clear lacquer is sprayed on to keep the surfaces clean.
- 23** A T5 technical jack plane and shooting knob, with a blade sharpened dead straight, is used to trim the board ends on the shooting board. Any correctly sharpened jack plane will do this job.

The checkers

- 24** Before making the case, try making the checkers – the pieces that are moved on the board. These are made from 21mm-diameter hardwood dowel. Standard dowel may not be quite round, but some careful sanding will take care of this. A jig is required for cutting the checkers. I decided to use the brilliant little Z-Saw mitre saw set. It is very

precise, quick and safe; on a powered machine this would not be so.

- 25** Two length stops are fitted to the jig: one determines the checker thickness, the other is for the Z-Saw mitre device to press against – between the two you can achieve repeatably accurate results. You need a minimum of 30 checkers, plus spares, but the production rate is actually quite fast using the fine-toothed pullsaw.
- 26** The counter faces are sanded on a sheet of medium and then fine abrasive. The edges will still need a final de-fluffing. Spray the natural-finish checkers with a clear lacquer to prevent them from getting dirty.
- 27** Now dye the other set black and leave them to dry, then re-dye them if necessary. Once they are fully dry, spray with more clear lacquer. All spraying operations must be done in a well-ventilated area, well away from naked flames.

The box lids

- 28** Normally, wide boards would be glued on and sawn down the middle to separate them afterwards, creating two matching lids. However, I had some walnut that was nearly at the right size, so I made each board lid separately. The butt mitres were carefully measured and cut, again using the Z-Saw mitre kit for very accurate cuts.



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29 Glue is run along the lower face where it will meet the board and on the mitre faces. When assembled, the surplus glue can be removed without it marring the board surfaces, as they have previously been sealed with lacquer.

30 Frog Tape was used to bind the corners closed, allowing the glue to exude. After that, a series of clamps were lightly applied to help close all possible gapping. The joints should then be tight enough to avoid needing any extra joint reinforcement.

31 Both outer faces are belt-sanded together for a longer – and therefore flatter – surface when sanding. The edges are belt-sanded together in the vice for completely flush surfaces. Gaffer tape is used to maintain alignment. After that, all arrises are lightly broken and

all surfaces sprayed with clear lacquer to seal them, then re-coated once dry. All that remains is the fitting of box hinges and catches.

32 Masking tape holds the box halves together. The hinge positions were marked and an engineer's square and a marking knife used to complete the marking out.

33 A mortise cutter is set to just over the hinge leaf thickness and the recess is machined away. A sharp chisel is used to trim the ends and the hinge is checked for fit.

34 The hinge holes are drilled and screwed, then the hinges are carefully fitted without overstraining the brass. I always angle the screw heads so the slots form a pattern. The box stays closed thanks to 8mm diameter rare-earth magnets superglued into shallow holes.

FOREST PHARMACY

Emma Newlyn discovers the health benefits of a walk in the woods

As gyms, shops and restaurants have been intermittently closing their doors over the past year, many people have found themselves – for the first time in a while perhaps – spending more time in their local park or nearby woods and discovering anew that the natural world really is one of the best remedies out there for lifting the spirits and giving a sense of renewed wellbeing.

These benefits are well documented. As long ago as 400BCE Hippocrates extolled the necessity of 'airs, waters and places' for physical and mental wellbeing; Roman texts explain the benefits of green spaces; and gardens were known as an important addition to monasteries in the 1200s. In 1260, Italian medieval theologian and philosopher St Bonaventure saw them as beneficial 'not only for food, but also for recreation in the open air to aid the recovery of the sick and to preserve health and improve those fatigued by their spiritual studies'. Fast-forward several centuries and studies have linked the natural world to shorter recovery times following surgery, reduced symptoms of attention deficit hyperactivity disorder in children, improved health markers in cancer patients and a calmer mind. Being in nature has also become a popular form of ecotherapy as people around the world have increasingly been drawn to the Japanese tradition of *shinrin-yoku*, or forest bathing.





Nature's remedies

Many studies focus on the benefits to be gained from nature's sights, but its scent, particularly that of trees, also plays an important role in health and wellbeing. In fact, while there's much to see and touch in the woods, some of the biggest benefits are invisible – and right under your nose. Head out into woodland, for example, and you're likely to notice the colours and landscape change with the season – bluebells in spring, buttercups in summer, acorns in autumn, skeletal branches in winter. What's less obvious is that each tree you pass emits a particular

scent loaded with natural compounds that benefit physical, mental and emotional wellbeing. These are known as phytoncides, from the ancient Greek *phutón* meaning 'plant', and the suffix *-cide*, to kill, which essentially means 'exterminated by the plant'. Their purpose is to help plants and trees protect themselves from harmful insects and germs. They're also found in essential oils, including cedar, pine and sandalwood, contributing to their antimicrobial and stress-relieving properties. (It is of course important to note that these health benefits relate only to the living tree. When woodworking, you should always wear appropriate respiratory protection.)

Stefan Batorijs, a shinrin-yoku practitioner and founder and director of Nature and Therapy UK, has studied trees and forests for many years. He's not surprised that the natural world can be so beneficial for its human residents. 'It's no coincidence that the defences a tree has developed to protect itself from attack also has this protective effect on humans,' he says. 'We evolved within the forest environment over many

millions of years, and we carry an average of 15% tree DNA within us.' Phytoncides' volatile substances are released mainly from trees, with the highest levels found in species such as pine from June to September. Certain types, such as alpha-pinene – a substance shown to have antimicrobial, anti-inflammatory and neuroprotective benefits – are more abundant at night, while levels of isoprene – a natural chemical that protects the plant from heat stress – are higher during the day. Alpha-pinene in particular is an important part of the fresh woody fragrance in a pine forest and interestingly, it's also linked to improving the non-REM stage of sleep – perhaps that's why a camping trip can be so refreshing. 'When you analyse the properties of the essential oils distilled from tree resins you begin to realise the amazing natural pharmacy in the forest,' says Stefan. 'Many of these compounds have a powerful effect on the brain,



acting almost like a narcotic by tranquilising the neural receptors that have been triggered by stress.'

There's also evidence that the phytoncides have antibacterial and antifungal qualities, which trigger an increase and activation of NK – or natural killer – cells when inhaled. These cells kill tumour- and virus-infected cells in the body and researchers are currently exploring whether time spent in forests can help to prevent certain types of cancer. Stefan is passionate about nature's healing properties: 'The complexity of forest ecology is not yet fully understood, neither the symbiotic relationships that certain trees have with each other, with the mycorrhizal fungi that connect them, or how their combined biogenic contributions to the atmosphere impact on human health. But I would suggest that without breathing in those microdoses of phytoncides, we would all suffer far greater bacterial and viral infections.'

FOLLOW YOUR NOSE

Here's how you can get better acquainted with the trees around you and benefit from their phytoncides. While all plants and trees emit phytoncides, pine, oak, cedar, and birch have shown marked benefits in the UK. To find the strongest concentration, it's recommended to head into the centre of a forest and stay close to the ground. Spring and summer are when these chemicals are at their most abundant and you'll find them in a greater concentration in coniferous forests than broad-leaf woodland. Here are just a few of the benefits they offer:

Pine. Perhaps the most well-researched tree for producing phytoncides, pines seem to contain the highest amount of beneficial chemicals. They contain antimicrobials, while limonene and pinene compounds can provide antioxidant and anti-inflammatory benefits for the respiratory system.

Birch. With an abundance of the natural compound betulinic acid, birch is a prime example of how a tree's oils and phytoncides can aid in health and wellbeing. Studies suggest betulin has strong anti-cancer properties, which interact with the body's mitochondria and aid in the reduction and prevention of tumours.

Cedar. Popular in ecotherapy, as is the Scots pine, cedar emit large amounts of beneficial phytoncides. Its essential oil is said to be antiseptic, anti-inflammatory and antifungal, but if you want to get the benefits directly from the tree, it's best to visit in spring and either early in the morning or late in the evening.

Oak. In South Korea, where shinrin-yoku is widely recognised, much of the land is covered in oaks, where the phytoncides are found in the bark and the leaves. There are thought to be more than 500 different types of the species, producing differing amounts of these chemicals, so try visiting as many different areas of oak forest as you can.

Psychological boost

Nature performs more than physical feats, however, as Deborah Nickolls, a specialist wilderness guide and co-founder of bushcraft company Wild Human, knows all too well. She's explored some of the wildest parts of the planet, with expedition experience in the Earth's major ecosystems, and is an expert contributor to BBC World Service. At home in the Lake District, she maintains a close connection to the trees around her. 'When guiding people through tuning into the woods, I always encourage making use of all the senses,' she says. 'Smell is [often] the least appreciated and understood one, but I know that filling your lungs with the scents of the woodland is, for me, hugely uplifting. I'm also interested in why people often have a strong affinity with certain trees. Their longevity appeals to many of us, particularly ancient oaks, but I also love birch trees. From a bushcraft perspective, they give us so many useful materials, but there's also a positive feeling when among them that may well be a result of the phytoncides they emit.'

Of course, not everyone lives in or near woodland. In this case, you can bring some of the benefits of the forest pharmacy into your home, as Deborah explains: 'We use essential oils in a diffuser, in the bath or in massage oil. We regularly use trees such as pine, cedar and sandalwood, but breathing in the scents of the changing seasons in the woods is a powerful way of feeling in tune with nature and its cycles.' What better reason to start planning a future visit to a wooded haven?

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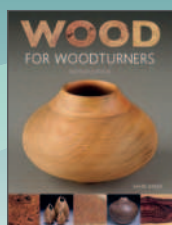
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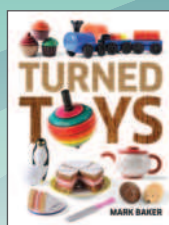
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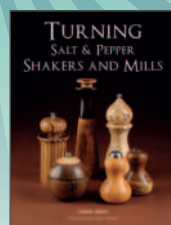
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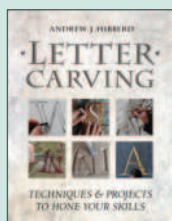
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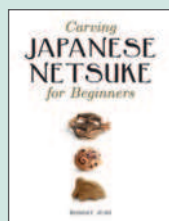
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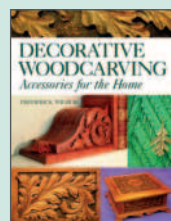
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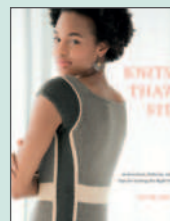
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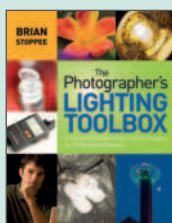
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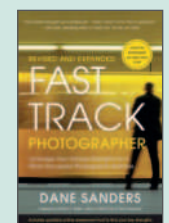
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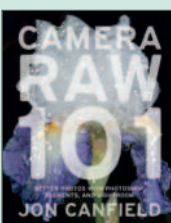
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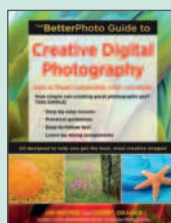
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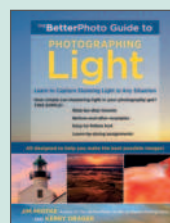
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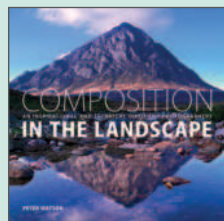
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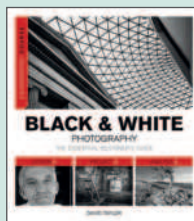
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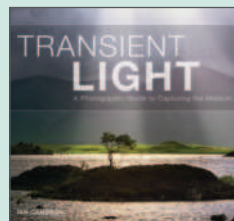
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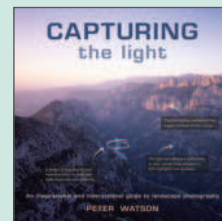
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Conservation meets making

Franciszek de Sage shows how non-interventive techniques can be used to conserve a precious tea caddy

This project is an example of a preventive conservation. It didn't involve work on the actual tea caddy, but only making a box for it, in which the original piece would be kept. When the tea caddy arrived in the workshop at West Dean College, it had a badly twisted lid with one of the corners lifting up to 9mm. Unfortunately, soon after the treatment to straighten the lid, which at the beginning seemed to be successful, the corner started to raise back again. My tutor suggested the idea of making a box, which could be used to put continuous pressure on the lifted lid but could also be disguised to be a facsimile of the object. This project demonstrates a concept that could be useful in other situations, where a decorative housing is required to keep an object on display.

Design

In the design process of the box my main concern was function: pressure

on a warped panel and an environment of fluctuating humidity can help to flatten the twisted lid. Second was safe and comfortable handling, and finally, the aesthetics of the box, all of which had to be taken into consideration. Magnets solved the problem of closing the box as they allowed for easy access to the original piece, without any unnecessary obstacles, i.e., opening a lock with a key, which could easily be lost.

To allow easy access to the tea caddy the front and sides of the box drop down – only the bottom and backboard are fixed. All vertical joints in the box are mitred. The fact I used mitred sides influenced the idea of how the piece could be finished. As none of the sides have fixed joints, it was possible to apply photographs of the actual tea caddy on the box's side panels. This way, the idea to not overshadow the true hero – the tea caddy – was achieved, and the box could stay only a functional piece.



PHOTOGRAPHS BY FRANCISZKE DE SAGE

1 The lid of the tea caddy is put under continuous pressure **2** Veneering the mitred edges **3** A sheet of Perspex stops the lid from sticking to the original surface of the tea caddy **4** A small collar is stopping the sides of the box from dropping down while closed

Making the box

As a substrate for the box, I used MDF boards and to make them look more pleasing to the eye, they were veneered. When light coloured Honduran mahogany was chosen, the boards were veneered on both sides using a vacuum system. It was crucial that the boards would stay dead flat after veneering, otherwise the open mitre joints wouldn't close properly. The first attempt at using PVA glue was unsuccessful, with ends of the 300mm-long veneered board cupping and twisting over 1mm. Presumably the problem was the water content in the glue, causing shrinkage of the veneers. Because of the irregular density of the wood, shrinkage created uneven forces that led to cupping and twisting of the boards. As a solution, I used water-free West System Epoxy Resin.

The mitred edges of the sides were also veneered to cover the MDF. I made special jigs allowing easy and comfortable clamping when veneering.

I decided to use neodymium iron boron magnets to get the right amount of pull to keep the lid of the tea caddy down. In total, 14

magnets – size 5mm dia./5mmA – were put in: seven in the lid and seven in the case, with each pair creating 0.8kg pull to make a total pull of 5.6kg. The amount needed for the pull was checked before, simply by putting small weights on top of the tea caddy lid until it went flat. The magnets were glued in drilled slots with acrylic resin Paraloid B-72.

I fitted the bottom of the lid with a sheet of Perspex. It was added to protect the surface of the tea caddy from sticking to the inner surface of the lid of the box while being pressed down. Lipping in English holly was made slightly wider on the lid than on the case to help with opening the lid. It is widest at the corners, suggesting to the user a safe way of opening – with both hands holding the box and pushing the corners of the lid with the thumbs.

For easier handling, I fixed the mitred dropping sides with small magnets – with a pull of 0.12kg and size 3mm dia./1mmA. This way, they are able to remain in a vertical position without any help, otherwise it could be hard to hold three sides closed while trying to put the lid down. The sides of the box do not drop down while it is closed



5



6



7



8

5 Small magnets are fitted in the side's edges **6** Feet sitting in shallow holes prevent the tea caddy from rocking **7** The tea caddy sitting in its purpose-made box **8** The tea caddy in the new box with one of the sides down

thanks to a small collar, also made of Honduran mahogany, around all sides of the case. It is glued in the groove inside the lid, flush with the rest of the surface.

Box interior

Inside the box, at the bottom board, I inserted four square mahogany blocks with shallow holes drilled in them. When the tea caddy is put into the box, the little bun feet sit in these holes. This has several functions: firstly, because the tea caddy doesn't sit flat on a surface, each hole was drilled to a specific depth, which prevents the caddy from rocking; secondly, as the caddy has a set place, it is always pressed with the same amount of force; and finally, when the box is closed, the tea caddy is locked into place, which allows for safe transportation from one place to another.

Finishing

Finally, the box was finished with archival-quality photographs of the tea caddy glued on each side. After several tests, I decided to use PVB

in acetone – 15% w/v solution – as most appropriate. It has shown enough strength to bond paper to wood and, because of the fast evaporation rate of acetone, didn't damage the photographs. The final stage was to apply brass bun feet similar to the ones on the real tea caddy.

Conclusion

This project shows well the difference between conservation and restoration. When all non-interventive treatment methods had failed and the lid of the tea caddy was still raising, I had to look for different solutions. The standard restoration practice would be to peel off the veneer from the top panel of the lid and then glue it on a new substrate, or at least back the panel with cross grain battens. All that would mean removing a lot of original material.

Making an extra box shows more of a conservational approach, where the most important aspect is to use non-interventive techniques. The piece is now well protected and further degradation shouldn't occur.

PERFECTION – PLAIN AND SIMPLE

PHOTOGRAPH COURTESY OF WOODWORKS OF LEWES

Shaker style looks as contemporary today as it did 90 years ago. Derek Jones investigates its enduring popularity

The clean lines of this Woodworks of Lewes kitchen are faithful to Shaker ethics while embracing a 21st-century look

It is a fair assumption that owing to their philosophy of celibacy the Shakers were never going to endure, but their furniture designs have certainly influenced style for the past 90 years or so. Today the sect's belief in well-made simplicity for the sake of function alone is reproduced more or less faithfully, give or take the odd decorative architrave and pediment, in kitchens all over the UK and the USA.

The Society of Believers in Christ's Second Appearing – they were dubbed Shakers because they were said to shake with fervour – was founded by Manchester-born woman Ann Lee who, along with eight followers, sailed to the New World in 1774 to escape religious persecution. The group went on to set up a social order based on equality, sharing and personal anonymity. By the time of the American Civil War in the 1860s, around 6,000 people were living in 18 Shaker communities.

The Shaker philosophy of simple, celibate and communal living was strictly observed by 'families' which established a pattern of work and devotion, and Mother Ann's advocacy of 'hands to work and hearts to God' was followed by each member, even the small children being kept fully occupied except at times of worship.

Fashioned for function

The sect believed that every object in the home should have a function and that decoration was unnecessary, their favourite sayings being: 'Whatever is fashioned, let it be plain and simple and for the good' and 'Beauty rests on utility'.

Fundamental to their creed was that each item had to be made perfectly. This led to a high level of craftsmanship, the over-riding characteristics of which were unity and simplicity. Ornamentation of any sort was considered to be vain and useless ostentation.

However, the Civil War saw their land and buildings torn apart and the industrial age that followed brought mass production with which the communities could not compete. Today, the few Shakers that are left function only as custodians of the movement.

Before their demise, however, they were using mail order catalogues and even had a showroom from which to sell their ladder-back chairs to the world during the mid-19th century.

By the 1870s the factory at the Shaker community of Mount Lebanon, New York, was kept busy fulfilling orders and in 1927 a No.7 armed rocker with a cushion rail found its way to Denmark where it took the fancy of Danish Modernist architect Kaare Klint who ordered measured drawings of the chair so that they could be used as teaching aids, thus perpetuating the design.

This was in line with the doctrine of functionalism that took hold of designers after World War I and by the outbreak of World War II the Danish Cooperative Wholesale Society had begun a movement to make well-designed, attractive, affordable furniture that could be built in factories for everyday use – very much in the spirit of the later Shakers.

FOLK ART TRADITIONS

American folk art varies from region to region. Wherever the Shakers settled, they picked up some of the qualities of these traditions. For example, their simply constructed wooden toys, rose-painted boxes and rag dolls are similar to New England styles. Because the Shakers did not believe in taking individual credit there are no names attributed to particular makers.



PHOTOGRAPH BY ANTHONY BAILLIE/GMC PUBLICATIONS

Derek Jones tries out an old Brookman dovetailer that is still used to make Shaker kitchen units at Woodworks of Lewes

Statement pieces

The society set up its own factory, FDB Mobler, and made Borge Mogensen head of the project. Apprenticed as a cabinetmaker, Mogensen had worked for Klint and recognised the appeal of the Shaker style. Meanwhile in the UK, designers like Charles Rennie Mackintosh were adopting and adapting the simple style to make statement pieces.

In his book *The Shaker Legacy*, Christian Becksvoort reports that the wheel had gone full circle by the 1950s when Scandinavia began exporting its mass-produced furniture to the United States. He says: 'Many Americans, myself included, grew up with the Scandinavian modern style, admiring its clean lines and crisp functionality, completely unaware that at least some of the furniture's roots could be traced to the Shaker communities on our own shores. Those of us who became furniture designers discovered this fact; many of us would explore the Shaker tradition, drawing direct inspiration from its purity and simplicity.'

Apart from makers on both continents making fine replicas of Shaker furniture in the traditional way, there are countless more producing the style commercially, and in volume, so it's something of an anomaly that I find this particular reproduction quite acceptable. Other styles that attract mass appreciation and as a consequence mass production can come across as faint imitations lacking in style and substance, and I'm convinced the answer to this owes much to the pared-down aesthetic of the Shaker style being ideally suited to mass production long before it was ever conceived.



The No. 7 armed rocker that introduced Shaker style and principles to Europe

Ahead of its time

We talk about certain styles of furniture being ahead of their time and generally this refers largely to appearance, but when used to head up a discussion about Shaker furniture this implies so much more.

I have a tendency to come over all philosophical when researching articles like this as my appreciation of the pieces becomes mixed with a feeling of sadness for those craftsmen of a bygone age who never witnessed the true extent of their influence. It is uplifting though to know that their efforts are still being recognised as a contemporary solution to the dilemma of producing good-quality traditional furniture with an eye on affordability.

One example of modern Shaker style in full production can be found at Woodworks of Lewes, who design and build bespoke furniture and are also very well equipped for repetitive work. A typical setup you might say. Traditional methods of construction are a predominant feature of their cabinet work. Rebate and housing joints are in use along with the various mortise and tenon joints, albeit cut by a machine, but the process has some parallels with those of bygone days.

Helping to make this connection with the past are a number of older machines refurbished and brought up to current specification and in daily use. A Wadkin straight-line edger with its caterpillar track and auto feed from the 1950s is more impressive than the Altendorf for very different reasons. Likewise, a Bursgreen planer thicknesser



As the industrial age swept across America the Shakers began to see the sense of machine-made joints like these, but were too late to save their communities



This Wadkin straight-line edger with caterpillar track and autofeed dates from the 1950s and is still in use at Woodworks of Lewes

and Cooksley mortiser from the same era are crunching their way through solid timber the way they have done for the last 60-odd years. Engineered boards are used here but there is an aversion to MDF for anything other than templates.

Soft-core Shaker

Of course, in the strictest sense this is not 'hard core' Shaker even though their craftsmen embraced modern machinery as it became available and I'd like to think that given time they would have had no problem coming to terms with new materials, providing that is that they sat comfortably with their philosophy that the beauty of an object could be measured by its ability to function.

It could in fact be argued that machinery has improved Shaker design. Machine-cut dovetails, though not the prettiest of joints, amount to a significant structural improvement with the commercial benefits of producing virtually the same product in a fraction of the time.

The early 25-pin Brookman dovetailer made in the 1960s, seen on the previous page, was discontinued by the mid 1970s and replaced by a smaller version with 15 pins. It's a fully automated machine cutting pins and tails in succession in what appears to be mechanical sleight of hand.



Brother Ricardo Belden, making wooden oval boxes in a workshop at the Hancock Shaker village near Pittsfield, Massachusetts

I've heard people suggest that Shaker style lacks imagination and also that it is the purest form of 'utility' furniture and I wholeheartedly agree with the latter but not the former of these statements. If we accept utility as being the ability of a commodity to satisfy human wants and needs then the Shakers were very much the pioneers of this concept.

Market forces

Less documented but crucial to understanding the Shaker way is their awareness and acceptance of external market forces. Although never intended for their own personal use, they occasionally produced goods for sale that were decorated, the justification being that they were produced with the sole intention of generating revenue. This is especially evident on some of their promotional printed material and ceramics. Hypocrisy or a good nose for business?

For this enduring style there can be no final analysis in a way that other styles and their legacies are calculable by their finite existence. Diluted and from the past it may be but it is still very much among us the moment we decide to do something hands-on in the workshop.

WHERE TO SEE SHAKER WORK

In the UK:

The American Museum, at Claverton near Bath, BA2 7BD

Web: www.americanmuseum.org

In the USA:

Hancock Shaker village, Pittsfield, Massachusetts

Web: www.hancockshakervillage.org



Functionality is the keyword of this Shaker-influenced pantry design



SHAKER-STYLE CANDLESTAND

Rick Rich makes a three-legged table inspired by Shaker furniture

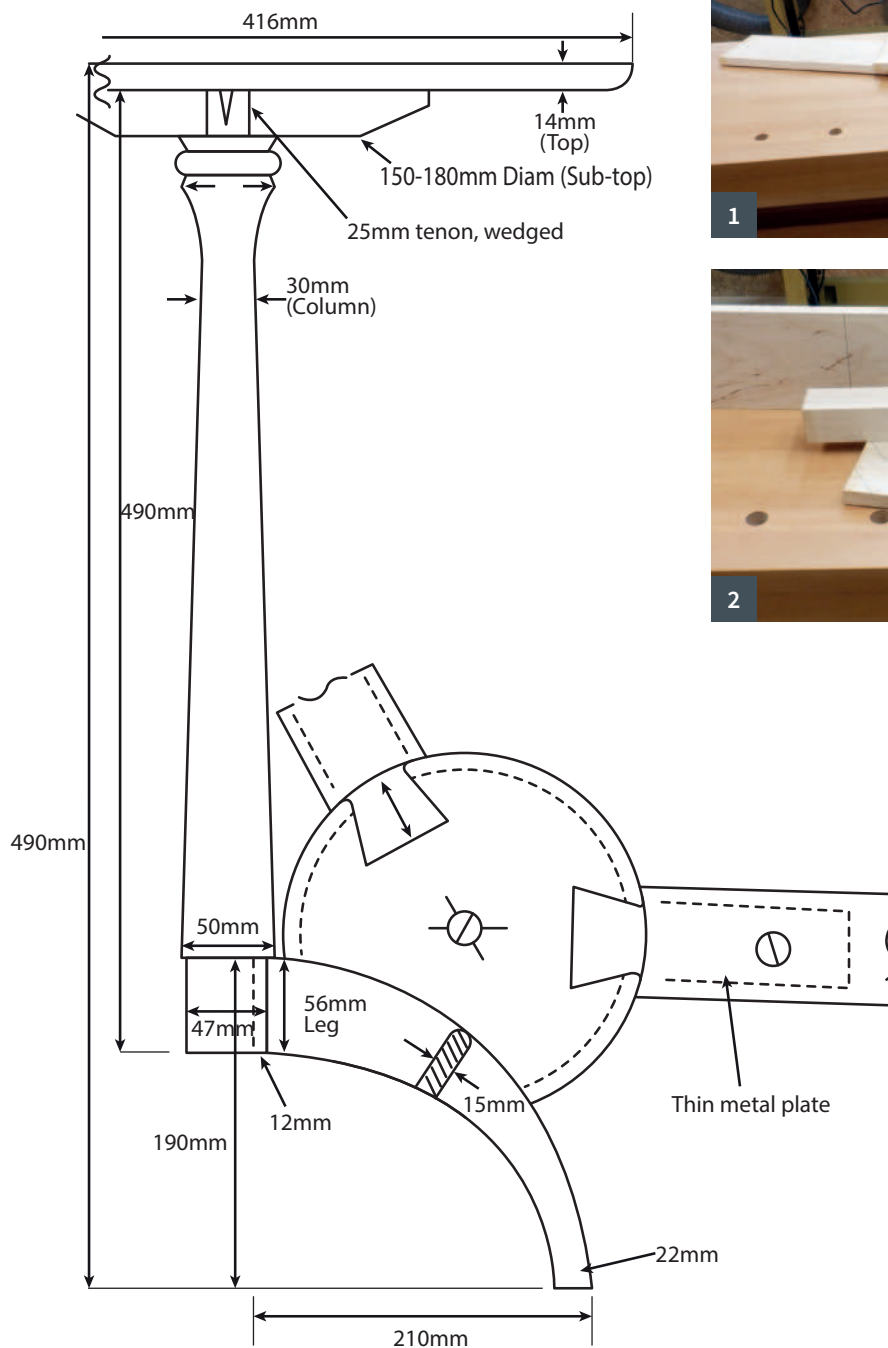
In this article, I will explain how I made a Shaker-style candlestand table. This was my first attempt at this particular candlestand, and I was pleased with how it turned out.

I wanted to use mainly hand tools for this project. I allowed myself the use of a hand-held corded jigsaw and of course the lathe as far as power tools go. The design is a hybrid from Shaker shop drawings and scaled a bit to some pieces of maple I had in the workshop, an 8/4 chair leg blank 495mm long, a 190mm-wide board about 0.6 metres long and a 150mm wide board just under 1.8 metres long. This meant a glue-up for the top and a maximum 50mm round column piece. Most of the drawings I saw have the centre column a bit thicker at 65mm or so.

From what I have read about these dovetailed three leg tables, it seemed important to have a metal 'spider' under the legs securing them to the column and to each other for strength and longevity. The downside is that anyone looking underneath (which a woodworker would do) won't see the precise fitting of the hand-cut sliding dovetails. The upside is it will hide an ugly fitting one ... or two.

I made the first few spiders from duct sheet metal, which I could cut easily enough with shears but looks like cut sheet metal and modern Phillips head screws. A trip to the hardware store resulted in some rather expensive slotted head brass screws and brass sheet that cut even easier than tin into a table spider. I think the extra cost is worth it for the more traditional look. Either way, it's likely that no one will notice the difference – except your woodworking friends.

Making the candlestand took a few evenings and a leisurely Saturday. Here is how it was put together.

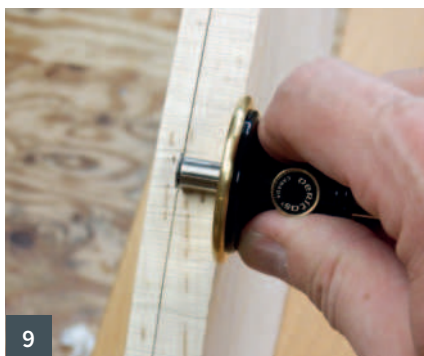
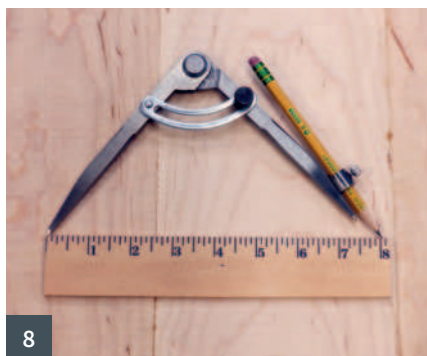


Preparing the materials

- 1 The raw materials in maple are: an 8/4 chair leg blank 495mm long, a 190mm-wide board about 0.6 metres long and a 150mm-wide board just under 1.8 metres long.
- 2 I drew the three legs on the smaller board using a template of the leg cut out of hardboard to keep them the same. The sub-top is just over 160mm because of the splits at the board end. The long 160mm-wide board is ready for cutting at lines 420mm apart. That will allow for a table top just over 410mm round.
- 3 I used a hand saw to cut the table top boards. This saw is several

years old and still cuts fast and fairly clean considering the aggressive teeth on it. It is a cross-cut tooth pattern, but I have used it with moderate success for small rip cut jobs.

- 4 Here are the candlestand parts cut out and ready. It's a little hard to see in this photo, but the legs could have been selected from straighter stock. The grain turns near the leg bottoms resulting in a weaker leg. On the next table I build, I will pay more attention to the wood used for the legs. Straight grain will make stronger legs. It doesn't really matter right now, but in 100 years it will.



Making the table top

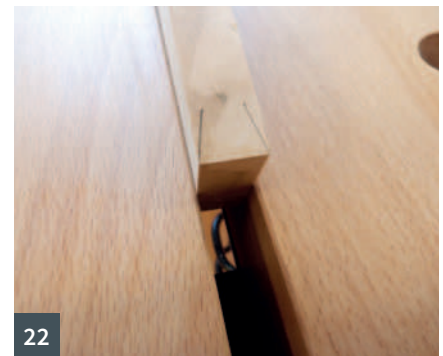
- 5** Here you can see the table top board orientation, looking at what will be the bottom of the table top. The middle board is heart side up and the two on the side are opposite. This will hopefully result in less warping and a more invisible glue line. The wavy edge will be removed as the top will need to be reduced in thickness by 6mm.
- 6** Straight, strong glue lines require accurate jointing. I used a No.5 jack plane and a small engineer's square to ensure the edges were square to the sides and the jointing was precise. The middle of each joint was planed a little deeper to make a spring joint where the middle compresses to ensure no gaps appear at the ends.
- 7** I used two pipe clamps to glue up the table top boards. The ends initially got a small clamp briefly to ensure the board edges didn't slip up or down. Once I tightened the pipe clamps, I removed the clamps on the board ends as they were no longer necessary.
- 8** My pencil compass nearly maxed out for the 203mm I need to make the 416mm circle. The middle needed to be located and the circle then drawn. I took the easy way and guessed. I moved the centre point a little here and there until the circle was fairly centred on the top. It's a simple task to centre by just making sure the waste is somewhat equal on the four edges outside the circle. At this point,

I clamped the top over the side of the bench and used the jigsaw to cut the top round. I cut about a quarter of the top in one go, then moving it so as not to hit the bench top with the saw blade. A more traditional route would be to make relief cuts on the waste, then hand saw the wood round. I will give that a try one of these days.

- 9** I set the marking gauge at 15mm (the topside is where the gauge face sets against) and marked the sides. All the wood on the other side of the mark was the waste that needed to be removed in the next step.
- 10** I used the scrub plane to cut away most of the wood in a hurry. By pushing the tool across the grain, nice curls resulted. I got close to the line and once it seemed uncomfortably close, I used the No.5 jack plane to bring down the waves and rough scallops of the scrub plane. This was followed up with the smooth plane for a clean, flat and shiny surface.

Making the legs

- 11** The three legs needed to be cleaned up from the saw marks and their ends smoothed. I started by clamping the legs tightly together using a small clamp. The clamped legs were placed in the vice and as you can see in this photo, a small scrap was placed underneath to further prevent movement while it was being smoothed with a spokeshave.



The small clamp keeps the legs in the same place while they are moved about in the vice for the smoothing of the top and bottom edge surfaces.

- 12** The end-grain surfaces where the dovetail will be cut were smoothed, along with the feet bottoms.
- 13** For both of these operations, I used a piece of scrap to prevent blowout of the grain as they were being smoothed with a hand plane. A sharp blade here is a must.
- 14** Lastly, each leg was tapered 3mm on each side from about two-thirds from the top to the bottom of the foot. I put a pencil mark 3mm from the edge each side of the foot bottom and used a hand plane to taper. Two doe's foot jigs held the leg securely between bench dogs, allowing easy and fast wood removal.

Making the sub-base

- 15** The sub-base started as a circle of board 180mm round. In the centre, I drilled a 10mm hole using a spade bit through the blank. This fit the Oneway chuck screw I used to hold the blank. I also used a small spacer, about 6mm thick between the chuck jaws and the blank so that the end of the chuck screw would not protrude through.
- 16** I started with what will be the top of the sub-base, the part that

will connect directly with the candlestand top. Once I trued up the edges, I made sure the centre went inwards slightly so the topside edges would firmly mate with the underside of the top piece.

- 17** Then with a parting tool, I cut a recess for the jaws to expand into. This allowed me to reverse the blank and work on the bottom of the sub-base.
- 18** I trued and flattened the blank and then made an angle cut that will later hold the four screws that secure the top piece with the rest of the candlestand. A little sanding and the sub-base was ready for drilling. Because the sub-base was held in the chuck using the expansion mode of the jaws, it allowed me to drill completely through the piece without threat of hitting the jaws or chuck body. I used a drill chuck in the tailstock and a much slower lathe speed, about 500rpm. I listened carefully as the bit broke through, stopping the drilling just after hearing it go through. There was no need to take unnecessary chances!
- 19** The column was the fun part for me as I really enjoy spindle turning and using the skew. I inset where the legs will be dovetailed into the column by about 2mm. I also checked the inset carefully with a straightedge to make sure there were no waves or curves which would be exceedingly visible once the legs were in place.



20 I added a little bead on the top of the column. I put it there because I like to turn beads, and thought it was a slight, yet hardly visible, improvement from the 'collar' look of the original candlestands.

21 I set the marking gauge at 12mm for the dovetail tenons. Each side of the legs and the top and bottom were marked. Afterwards, I realised I really didn't have to mark the top and bottom. It was sufficient to just mark the sides.

22 Here I measured in 3mm on each side at the bottom of the dovetail tenon and drew a line from the inset to the tip. Remember, this will be some of my first dovetails and I am just learning!

23 I put a small straight edge of wood carefully aligned with the marking gauge line and clamped it tight onto the workbench. I then used a flush-cut saw to cut straight down 3mm using the marks made on the top and bottom so I knew when to stop sawing.

24 A chisel made short work of the dovetail tenons, cutting from the side edge down to the base of the tenon. I found it a little tricky to get the sides of the tenon flat from top to bottom. By using the bottom of the chisel and laying it on the tenon side, it was easy to see where a little material needed to be removed.

25 I probably spent more time than necessary on this, but they were flat!

26 This is a technique I saw used by Christian Becksvoort. Christian

used cushion blocks of soft pine carved out and tapered to match the column. I had some pine scraps, so I gouged out a bit of a round area with a little taper to it. It was very easy to make, efficient and held the column solidly.

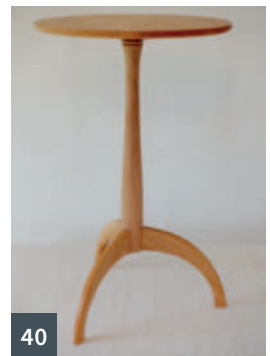
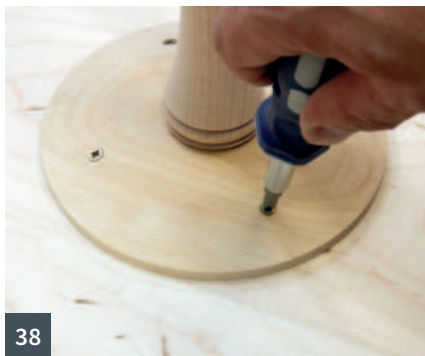
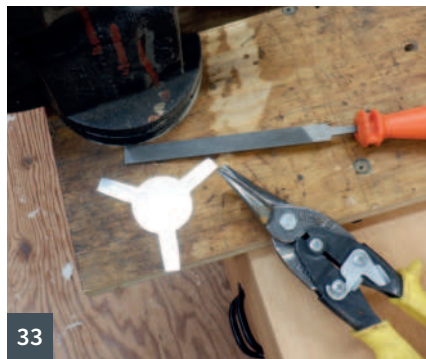
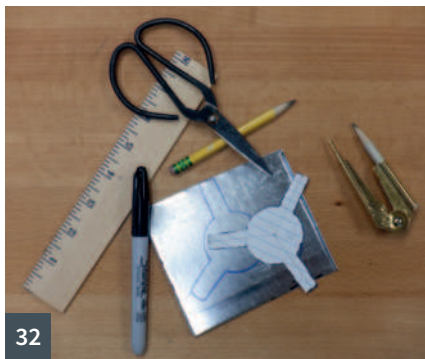
27 Here I have made straight lines up the column from the bottom. I used a 150mm square with a sliding rule to make the marks. As you can see, I cut inside the lines to make a cut from the bottom of the dovetail base to as far up the column as I could cut without cutting into the column area past the small turned shoulder.

28 I drilled down 12mm just under the shoulder cut into the mortise waste with a $\frac{3}{8}$ bit. This allowed me to chisel out the waste with confidence that I would not splinter past the shoulder into the column.

29 A pencil tip rubbed sideways on the dovetail sides and bottom made it easy to see where material needed to be removed. Removing too much would result in a loose fit, so careful cuts with too clenched hands on the chisel were made.

30 This was the third dovetail mortise cut and I think it fit the best. A nice tight fit that slid in with just hand pressure to the last 3mm and a tap with the mallet was all the joint required to fit nicely.

31 I now turned back to the table top. I used a spokeshave to round the edge profile so that it has a crisp top edge that flows into the bottom.



The metal spider

- 32** I fabricated the metal spider using a sheet metal cutter and file. On a piece of paper, I used a compass to mark 120° marks for three 12mm-wide legs protruding an additional 32mm from a 44mm round centre. After I cut out the paper spider, I marked the outline on a piece of sheet metal.
- 33** The metal was easy to cut, filed nicely and was drilled without problem. I drilled slightly oversize to the screws so the screws would slip through the drilled holes. I used sandpaper to smooth the file marks and sharp edges of the spider.
- 34** I later made another table spider from brass sheet metal. The brass shapes easily with sheet metal cutters, files and sandpaper. The store also had brass screws, which I found are exceptionally soft. A pilot hole and even using a steel screw to pre-drill can be necessary measures with brass screws.

Finishing

- 35** The sub-top was drilled about 40mm from the outside edge and countersunk top and bottom. I then cut a kerf into the column top tenon to receive a wedge that would secure the sub-top. I learned long ago that when wedging, be sure to put the wood grain

perpendicular to the wedge so the end grain takes up the pressure, otherwise split firewood may result! Once the glue was set, I cut the wedged tenon flush with the sub-top so that the table top would set on it without obstruction.

- 36** I put a little glue in the dovetail mortises, a small amount on the top sides of the tenons and pushed the legs home. A little tapping with my mallet seated them completely.
- 37** I then set the spider on the bottom of the column and made pencil marks where I drilled pilot holes for the screws. Once the screws were in, the legs and stand were all connected as one piece.
- 38** The last construction step was to screw the top to the sub-base. I orientated the table top grain with the sub-top grain to allow for wood movement.
- 39** Here is the table top after it was wet sanded with boiled linseed oil. The maple board looked somewhat bland when it was dry but it came to life after oiling and showed magnificent fiddleback, which brought me a smile of satisfaction.
- 40** Here is the completed candlestand. I really was happy with it and more importantly, my wife was happy with it!

The vintage toolbox

This month Colin Sullivan looks at multi-functional tool pads

Tool pads, or tool holders as they are called in the USA, evolved from the common bradawl, with different sized points stored in the handle. By the early Victorian period a whole variety of useful tools was included in the handle and they became 'tool pads', selling in their thousands. Rolls of tools that have a handle to take the various blades became popular about the same time and offered an even bigger selection of tools for the handyman.

These tool pads are self-contained items. Generally, they have a hollow handle and screw-cap top for the tools, keeping everything neatly together. They were made by all the leading tool companies; both here and in the USA, but European ones are not so common. They often turn up in poor condition with the top and tools missing; perhaps they have been carried around for years in a carpenter's toolbox, mixed with any number of other sharp instruments.

1 Made in the USA, this tool pad is 190mm long and contains nine tools: two chisels, two gouges, a tapered reamer, a screwdriver, a saw blade, a gimlet and, of course, a bradawl. The whole thing is very well made, with a fine cocobolo handle and screw cap, and a good solid nickel-plated chuck.



1

2 This has an English boxwood handled pad, 165mm long, with a simple pinch chuck operated by a left-hand threaded wing nut in brass. Only a few of the tools remain but I guess it would have contained a set similar to that in tool pad 1.



4

3 This Stanley tool holder is only 100mm long, with as many as 12 tools in a carousel type of fitting. The nickel-plated cover is shaped to form the chuck lock and cap in one, with a boxwood handle.



5

4 A favourite of mine, this is 127mm long and made from pressed steel with swing open sides containing nine tools, one of them a pair of tweezers! With no maker's name, this one is quite unusual and cleverly made.



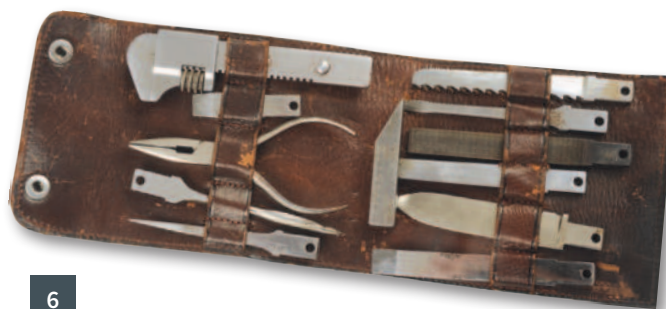
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5 Here you can see a number of variations on the tool pad. They all contain a similar array of tools as before: one with a hammer head that doubles as a lock for the chuck, one with a rare adjustable spanner at one end, and the handle forms a lock for the tools inside.



3

6 This is a very fine wallet of nine tools and a pair of pliers. The handle of the adjustable spanner has a slotted handle to hold the tools. It is German made by Heckler & Koch, marked DRGM. Beautifully made and finished in nickel-plate, it looks unused.



6

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